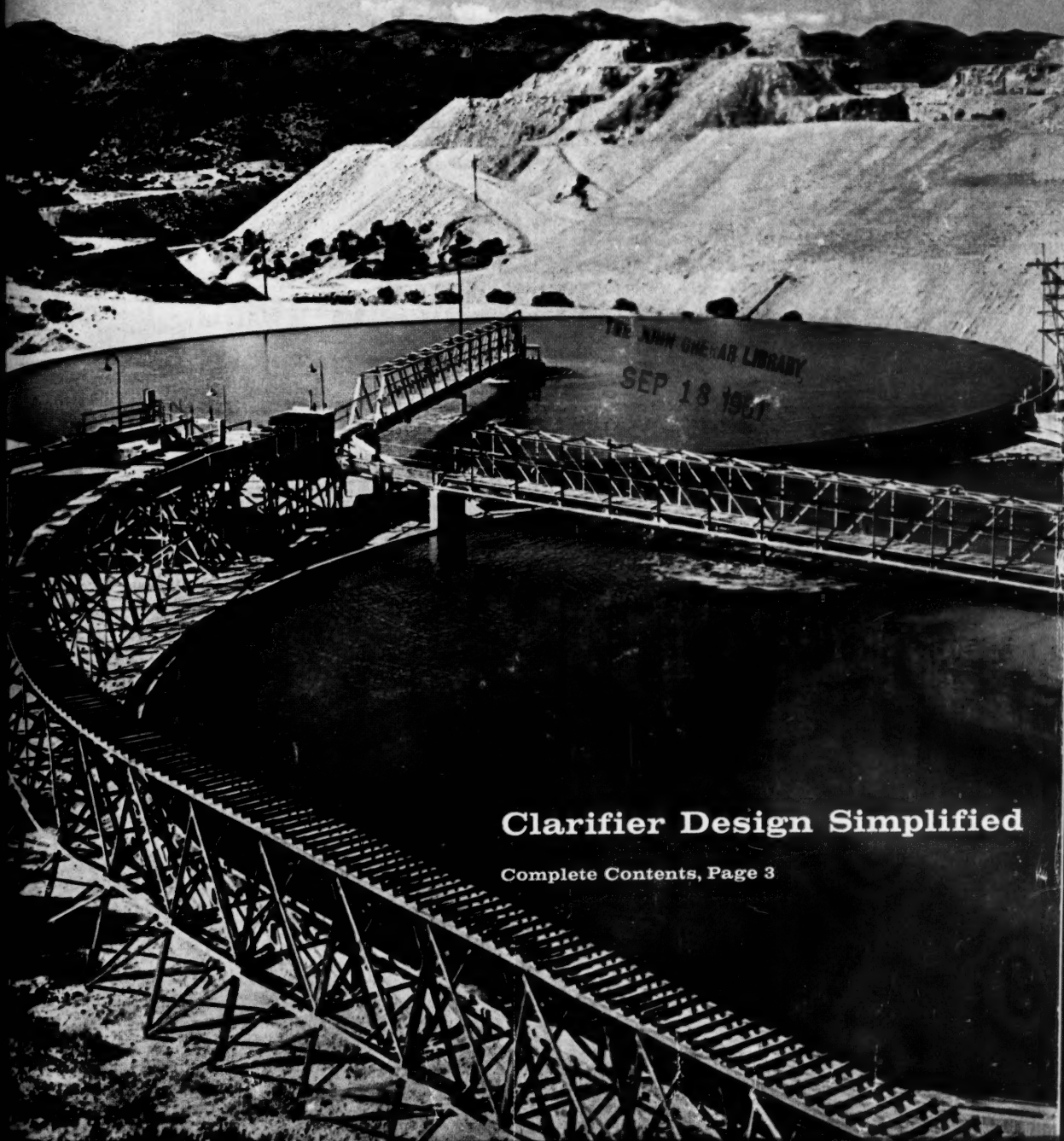


HEMICAL ENGINEERING

September 18, 1961

Craw-Hill Publication / Published every-other-Monday / Seventy-five cents

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Clarifier Design Simplified

Complete Contents, Page 3

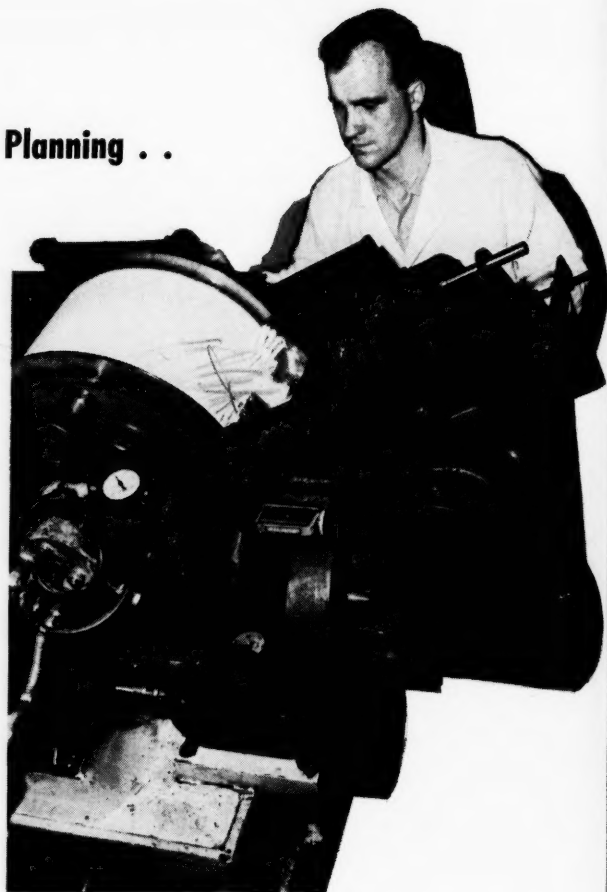
Taking the guesswork out of Process Planning . .

So often, chemical processors want to know *IF*—if a process involving liquid-solids separation will work on a practical basis . . . if a product can be obtained that will meet unusual specifications . . . if a way can be found to reduce needless product loss.

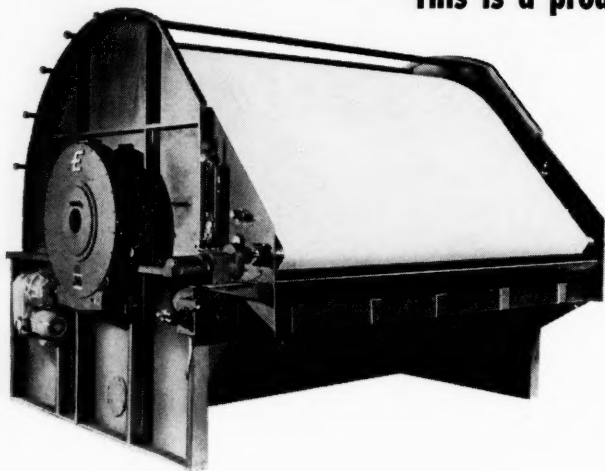
So often, too, Eimco's modern Research and Development Center has been able to provide clear answers to such processing problems. With your product samples and our insight into the science of liquid-solids separation, a trial process can be set up in the laboratory and tested in the pilot plant. If necessary, testing can be continued in your plant, with a platform filter station moved in and hooked into your processing circuit.

Eimco's research personnel match years of experience with whatever subtleties of liquid-solids reactions that may turn up in your projected process. Scientific testing tells you *if* your process will work before commercial scale operations are set up . . . and even gives you a knowledge of what your costs will be.

The Eimco representative in your area can put you in touch with Eimco research facilities. Call him.



This is a product of Eimco Research . . .



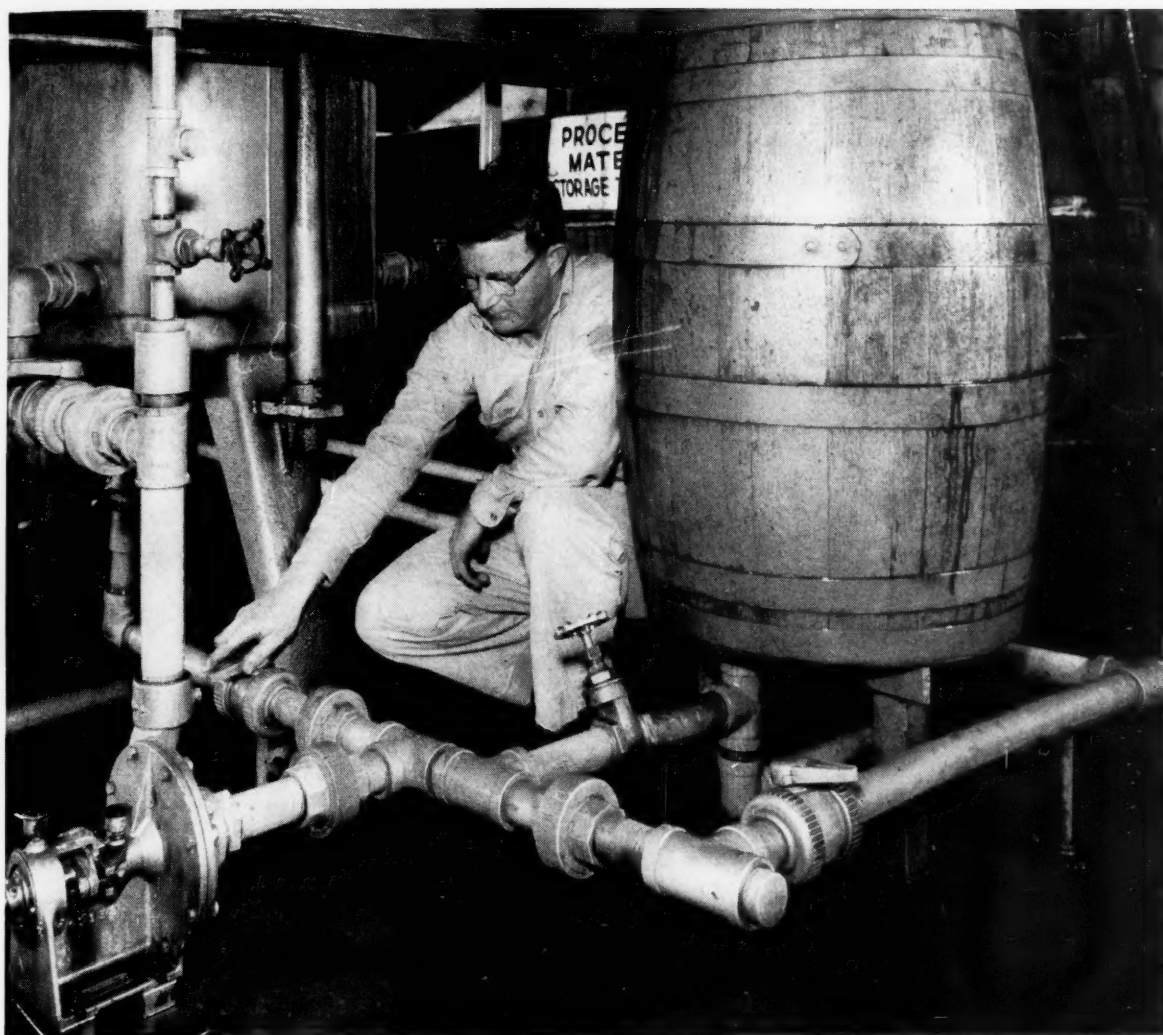
The EimcoBelt continuous belt filter was developed to eliminate troublesome blinding of the cloth filter medium in continuous filtration. This filter removes the medium for cake discharge and thorough cleaning to maintain maximum efficiency. Downtime for cloth change is less than a half hour. EimcoBelt filters have made it possible to handle slurries previously considered "impossible" for continuous filtration, thus greatly reducing costs in many operations.

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"Advanced Engineering and
Quality Craftsmanship
Since 1884"



It's a juicy job for Koroseal

ENGINEERS at this frozen food plant needed pipe that could keep fruit juices flowing continuously—and virtually automatically—through various processing stages. Metal pipe was out of the question. Citric acid would corrode it.

The answer? Pipes and fittings made of Koroseal rigid PVC by B.F. Goodrich. Nothing can corrode Koroseal. It's unaffected by acids, alkalis, salt, alcohol and just about everything else that ruins other pipe. Koroseal doesn't react chemically. It's odorless, non-

toxic, so there's no danger of product contamination.

Since Koroseal pipe weighs only $\frac{1}{4}$ as much as steel, it's easier and faster to install. It threads easily, can be cut, welded or drilled. It'll never rust, never need painting.

After three seasons' service, the owner of the packing plant had this to say: "Koroseal has met every one of our requirements. Not only was the installation economical, but we achieved the durability and sanitation that was so necessary. Our juice han-

dling operation runs 24 hours a day, and we haven't had to shut it down once because of a pipe or fitting failure".

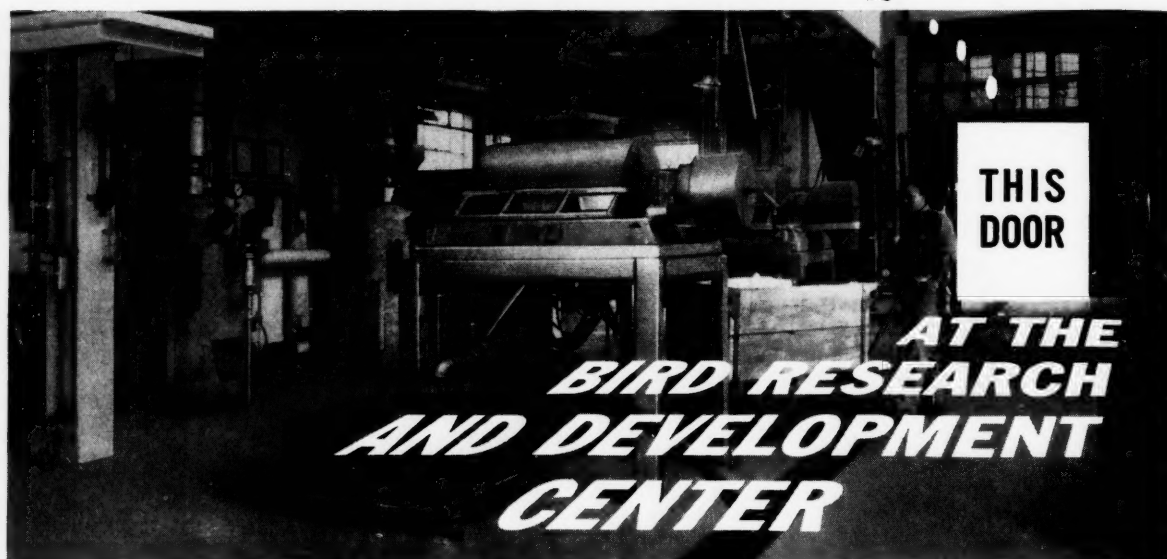
More and more companies are finding B.F. Goodrich Koroseal PVC pipe ideal for use wherever corrosion resistance, economical installation, minimum maintenance and long life are deciding factors. If you'd like to know more about Koroseal's advantages, call your nearby BFG distributor or write to us for a free booklet. *B.F. Goodrich Industrial Products Co., Dept. M-146, Akron 18, O.*

Koroseal—T.M. Reg. U.S. Pat. Off.

Koroseal rigid PVC products by

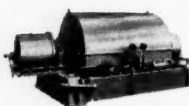
B.F. Goodrich

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and You come out with the right answer

Here are 8 good reasons why:



THE BIRD CONTINUOUS SOLID BOWL CENTRIFUGAL counts its varieties of successful applications in the hundreds. It comes in over a hundred different size and design variations.



THE NEW BIRD "COMPACT" CENTRIFUGAL with 6-inch bowl, running at speeds up to 6000 RPM, opens up new and valuable opportunities for both production and pilot plant operations.



THE BIRD CONTINUOUS SCREEN TYPE CENTRIFUGAL deliquors and washes crystals or granules from heavy feed slurries; effective wash with less than 0.1 lb. wash liquor per lb. of solids.



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THE BIRD PRESSURE LEAF FILTER offers large filter area, high rate of flow, working pressures up to 75 psi or more, in a wide range of sizes and corrosion resistant constructions.



THE BIRD SUSPENDED BATCH CENTRIFUGE is built for heavy duty service, with 26", 40" or 48" basket, perforate or imperforate. Custom built and accessoried; fume-tight or explosion proof if desired.

Eight Reasons Why The Recommendations Based On Tests At The Bird Research and Development Center Will Be Unbiased And May Be Depended Upon.

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MACHINE COMPANY

SOUTH WALPOLE, MASSACHUSETTS

BUILDERS OF THE COMPLETE LINE OF SOLID-LIQUID SEPARATING EQUIPMENT

Operators of the Bird Research and Development Center for pilot-scale testing to determine the correct equipment for the job. Yours to use.

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CHEMICAL September 18, 1961 ENGINEERING

CHEMICAL TECHNOLOGY FOR PROFIT-MINDED ENGINEERS

WHAT'S HAPPENING

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PRINT ORDER FOR THIS ISSUE 53,051
VOLUME 68, NUMBER 19

Chemical Engineering (with Chemical & Metallurgical Engineering) is published biweekly by McGraw-Hill Publishing Company, Inc., James H. McGraw (1860-1948), Founder.
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Subscriptions: Send correspondence and change of address to Fulfillment Manager, Chemical Engineering, 330 West 42nd Street, New York 36, N. Y. Send notice promptly for change of address, giving old as well as new address. Enclose an address label from a recent issue of the magazine if possible. Allow one month for change to become effective.

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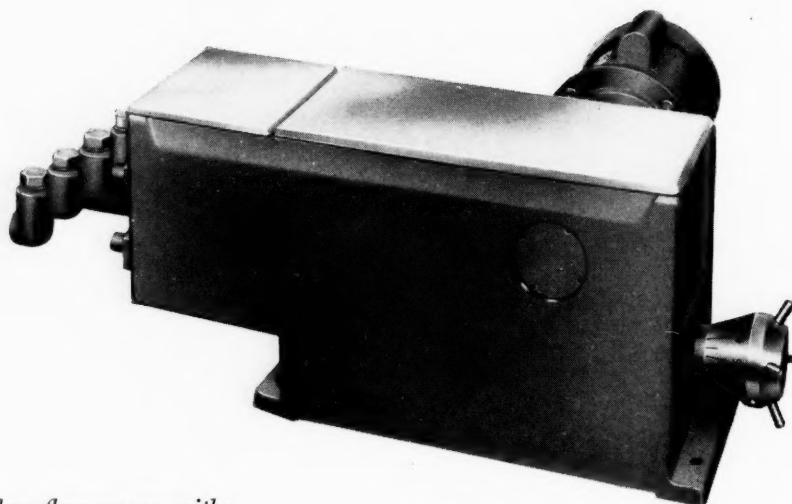
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NEW MILROYAL[®] CONTROLLED VOLUME PUMP



The low flow pump with:

Totally enclosed, self-lubricated drive • Adjustable capacity while running

If you meter low flows, here's the most perfect pump on the market . . . at the right price. Its novel, totally-enclosed drive unit operates in oil—practically takes care of itself. And capacity of the MILROYAL can be easily adjusted while operating—manually or automatically.


The new MILROYAL has been developed as a direct result of your needs. And to meet this "ideal" in precise metering and pumping, Milton Roy introduces, with this pump, a unique drive unit which:

1. Translates high speed rotary motion of the pump motor to low speed reciprocating motion with a minimum of working parts. Gear reducer is an integral part of pump and stroke adjustment mechanism.
2. Lubricates itself. The entire unit is totally enclosed . . . all bearing surfaces continuously lubricated.
3. Provides 0-100% stroke adjustment while operating from the *forward* end of the stroke, giving effective complete displacement of fluid on each stroke. Metering accuracy is $\pm 1.0\%$ or better.
4. Adapts readily to either electric or pneumatic stroke control units for use in automatic control systems.

MILROYAL pump capacities currently range from 0.89 gallons per hour (gph) for pressures up to 4,470 psi to 88.0 gph at pressures to 170 psi. As many as 9 MILROYAL pumps can be driven by a single motor. Present models utilize motors from $\frac{1}{4}$ to 1 hp, with larger motor units now in development. Either Step-Valve or Diaphragm liquid ends can be used.

Bulletin 258-1 describes in detail the operation of our new unique drive and what this means to you in more efficient, trouble-free operation. It lists all specifications for the "perfect" metering pump. Write for it.

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highlights of this issue

HOW TO DESIGN SEDIMENTATION SYSTEMS

How big a tank will you need to clarify that dilute suspension of flocculent solids? Don't send out an SOS for the expert; just go to the lab and get some basic data. This article (p. 167) shows how to take meaningful measurements, along with tips on how to correlate and apply them for design purposes.

SUPER ACID LEADS TO FERTILIZER SHIFT

Superphosphoric acid, "oleum" of the phosphoric family, possesses some unusual properties that make possible important new developments in high-analysis phosphate fertilizers. How super acid is made at Wilson Dam, Ala., is described in our Process Flowsheet (p. 160) by TVA chemical engineer M. M. Striplin.

PROF TRIES HIS HAND AT PLANT MAINTENANCE

A mighty big gap must be bridged when leaving the halls of learning for the rough and ready field of plant maintenance. There's a lot to learn—and a lot to unlearn. In this month's Operation & Maintenance feature (p. 198), an ex-chemistry professor tells some of his experiences when he moved into the maintenance area.

PLANT DESIGNERS NEED SUPPLIERS' HELP

Are equipment manufacturers remiss in their failure to provide complete engineering information (dimensions, weights, required clearances, etc.) to chemical plant designers? Yes, claims designer Philip J. Baukol (p. 171). Not so, rebuts the Process Equipment Manufacturers Assn. This exchange of viewpoints, we hope, will help resolve the problem.

FOR HIGH-TEMPERATURE, HIGH-PRESSURE APPLICATION...



**NEW 2 AND 3-WAY CECO VALVES
ARE READILY ADAPTABLE
TO YOUR REQUIREMENTS!**

Fabricated without organic materials, the carbon steel valves pictured here represent a new Chandler Evans valve design which lends itself to a variety of special-purpose applications.

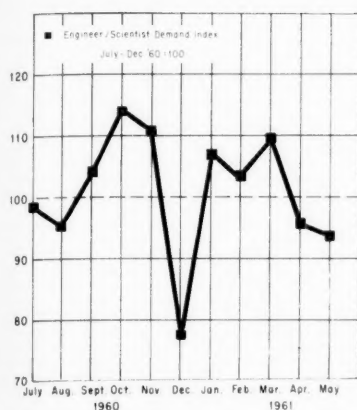
Requirements on this particular assignment were for valves to provide flow of demineralized water up to 400 gpm at temperatures to 600°F. and pressures to 2000 psig, with minimum maintenance for 25-year service. An air-operated actuator is an integral part of each assembly, and an air-supply system and remote control panel complete the package.

Development of valves in this series was facilitated by CECO's high-temperature test loop. CECO engineers accented flexibility in design. The valves can be scaled up or down to suit other flow, temperature or pressure requirements. They can be fabricated from materials compatible with corrosive fluids. They are ideal for remote control installation, using manually or electrically operated selector valves. Pneumatically actuated in present form, they can be adapted for mechanical, hydraulic or electrical actuation.

To discuss your requirements, contact Mr. Harold E. Francis, Nuclear and Industrial Products Manager.

CHANDLER EVANS CORPORATION West Hartford 1, Connecticut
A SUBSIDIARY OF FAIRBANKS WHITNEY CORP.





Pro: Job Market Index

Sir:

In your Aug. 7 issue (pp. 140-2) one of your editors wrote a story on our new Engineer/Scientist Demand Index.

The story was so well written in terms of accuracy of the information presented that I felt it worthwhile to write you to express our appreciation of the excellent job.

FRANK COSS

Deutsch & Shea, Inc.
New York, N. Y.

►Credit goes to Bill Schall, editor of the highly read *You & Your Job* department. You can extend the above chart with latest data for June (108.3) and July (96.5).—ED.



Pro: Bathtub Engineering

Sir:

I object to your answer of 10 hr. for the solvent tank described in the Feb. 6 issue (p. 162) to empty. This answer would be correct if the rate of draining were constant; however, chemical engineers should remember that the drain rate is proportional to the square root of

the fluid head and ascertain that this tank empties to the level where inflow equals outflow.

The rate of change of the level can be described by a differential equation which indicates that the steady-state level is approached asymptotically, and an infinite time is required to reach this state. The common bathtub is a convenient research facility to check the theory.

PETER KENT

Towson, Md.

►Mr. Kent refers to a letter from Thomas Garcia-Borras which posed this problem:

A solvent tank can be filled by two feed pipes in 4 and 5 hr., respectively. Two drain-off pipes can empty it in 3 and 6 hr., respectively. If the tank is half full to start with, and if all valves are opened at the same time, will the tank be filled or emptied? How long will it take?

Our answer was: the tank will be emptied in 10 hr. We invited CE readers to comment. So far, Mr. Kent has been the only one who disagreed. What do you think? We'll award \$5 worth of reprints (your choice, see p. 267) for the best letter received on this problem within the next month. Send it to Editor, Chemical Engineering, 330 W. 42nd St., New York.—ED.

Pro: Diameter Squared

Sir:

You made an error in the published version of my article on "How to Design Fluid-Flow Distributors" (May 1, pp. 83-6).

According to Eqs. (2) and (3) as printed, the orifice flow rate varies linearly with orifice diameter d_o ; actually, flow rate varies as the square of orifice diameter d_o^2 . This error could result in calculated values being off by a rather large factor.

These equations were stated correctly in the original manuscript. The slip evidently occurred somewhere in the process of editing or printing.

D. R. RICHARDSON

Union Carbide Chemicals Co.
Institute, W. Va.

►We regret the occurrence of these

errors. We're glad to confirm that Figs. 3 and 4, the nomographs which solve Eqs. (2) and (3), were correct as published.—ED.

Pro: Management Training

Sir:

Several of us in Ormet enjoyed reading Mr. Bott's management training article in the June 26 issue of CHEMICAL ENGINEERING (pp. 146-52).

The author's approach to handling training is more realistic and practical than most programs. His statement of "tying it back to the job takes theory out of the realm of fantasy" was impressive to me, and I think the general idea is excellent. He is to be congratulated on obvious outstanding success with his own company.

C. M. HENSLEE

Ormet Corp.
Hannibal, Ohio

Pro: Professionalism

Sir:

Your editorial on professionalism (July 24, p. 7) was excellent. Please accept my congratulations.

In my own exposure to engineers I find that many of them believe professionalism and profit are incongruous. You certainly cleared the air on this question.

ARTHUR L. DOWLING

M. W. Kellogg Co.
New York, N. Y.

Monoxide. Not Dioxide

Sir:

In your July 24 issue, p. 134, the item on smog control stated that a new muffler will reduce carbon dioxide in car exhaust fumes by 76%.

Don't you mean carbon *monoxide*? I cannot see how a catalyst could reduce CO₂ emission, or even why you would want to do so.

KENNETH FRANK

Chemical Engineering Consultant
New York, N. Y.

►Mr. Frank is absolutely right; the new muffler reduces carbon *monoxide* by 76%.—ED.

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PRODUCTIVITY
...PROFIT

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FOR AUTOMATION

PROBLEM: how to collect, record and transmit critical fluid flow data more accurately than ever before.

SOLUTION: custom-designed flow measurement systems from General Electric.

RESULT: reliable process control, simplified fluid accounting, precision batch blending and loading.

System instrumentation includes: true mass flowmeter, available in 13 standard ranges ■ null balance recorders, a full line of strip and round-chart ■ new telemetering equipment, analog and digital.

In addition, ticket printers and totalizing counters are available for visual digital display and pre-set counters may be added to provide precision control in blending and loading operations.

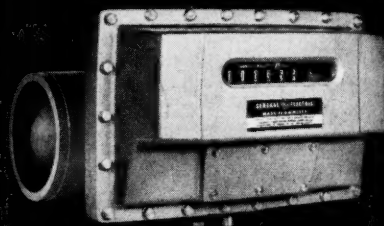
FOR FLUID FLOW PROCESS:

In a variety of system applications, these General Electric instruments cut operating costs and boost plant production . . . through *simplified* and *more accurate* measurement. No wonder they've been specified by process engineers throughout the world. *Performance-proved . . . on the line!*

For complete information, contact your nearby General Electric sales office or write Section 599-08, General Electric Co., Schenectady 5, N. Y. for the following bulletins: GEA-6925, Mass Flowmeter; GEA-6887, Null Balance Recorders; GEA-7163, Telemetering Systems. In Canada, contact Canadian G.E. Co. Ltd., 940 Lansdowne Ave., Toronto 4, Ontario. Outside the U.S. and Canada, contact International G.E. Co., 150 E. 42nd St., New York 14, N. Y.

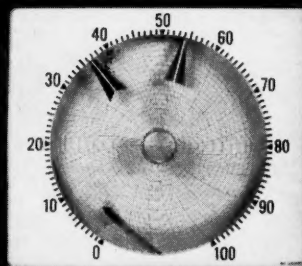
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Mass Flowmeter measures fluid flow directly in pounds, eliminates volume-to-mass conversion. $\pm 1\%$ accuracy unaffected by change in pressure, density, temperature, viscosity, flow rate. 13 standard ranges now available.

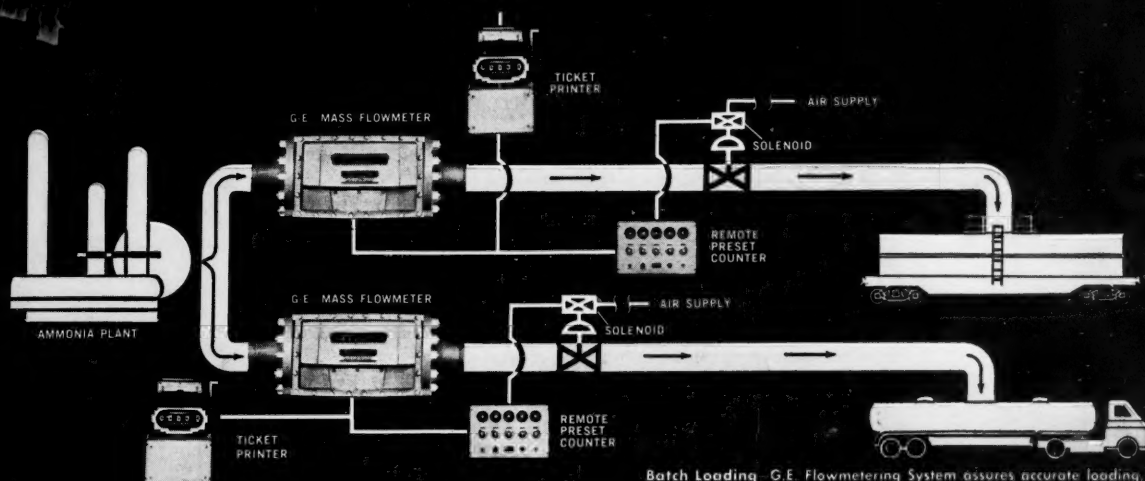
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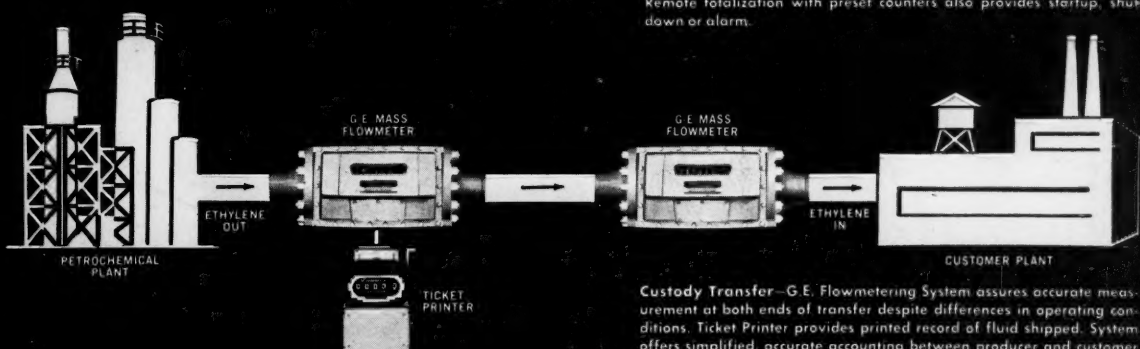
GENERAL ELECTRIC

General Electric Null Balance Recorders feature silicon diode reference voltage source for operational reliability; varied control forms for versatile applications; components mounted on swing-out panel to simplify routine maintenance. Full line includes multipoint, single and two-pen-strip and round-chart models.

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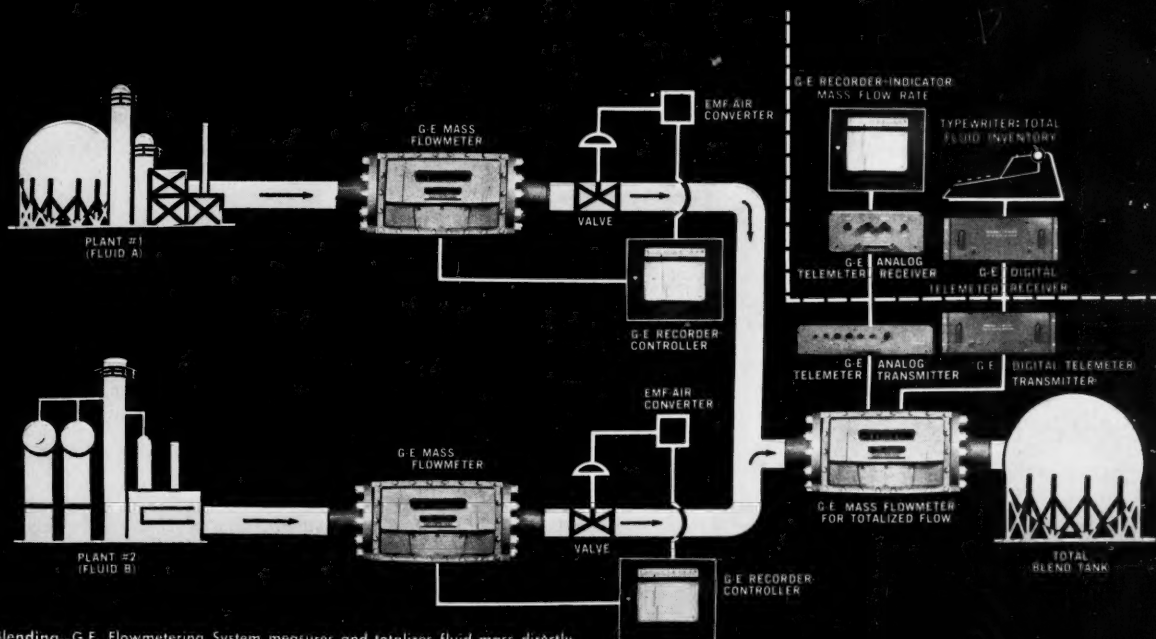


Batch Loading—G.E. Flowmetering System assures accurate loading, precise totalization; is unaffected by temperature changes in tank or pipe. Meter measures different fluids with no calibration change. Remote totalization with preset counters also provides startup, shut-down or alarm.



Custody Transfer—G.E. Flowmetering System assures accurate measurement at both ends of transfer despite differences in operating conditions. Ticket Printer provides printed record of fluid shipped. System offers simplified, accurate accounting between producer and customer plants and also in interplant transfers.

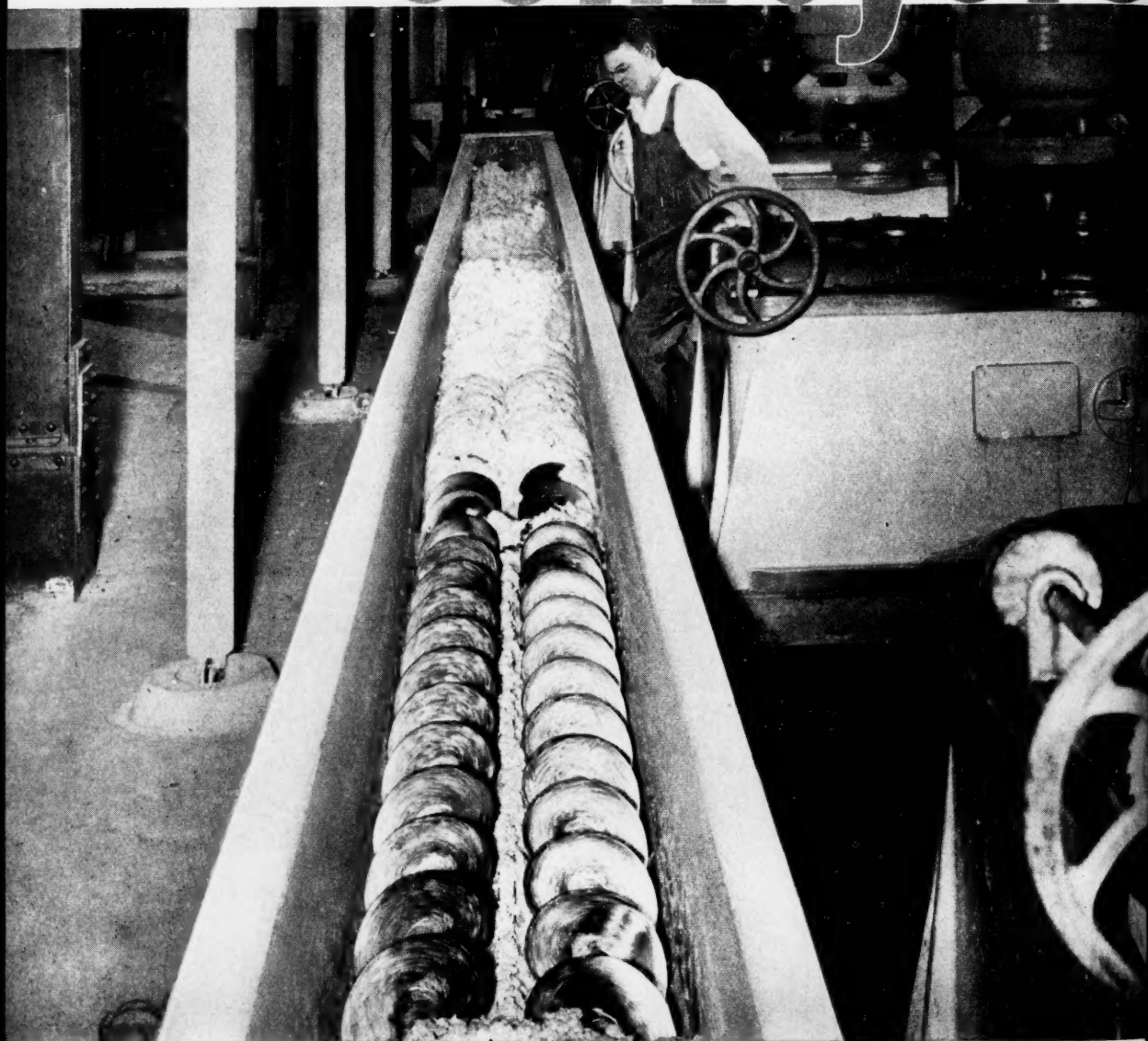
MEASUREMENT SYSTEMS FROM GENERAL ELECTRIC



Fluid Blending—G.E. Flowmetering System measures and totalizes fluid mass directly, eliminates laborious volume-to-mass conversions. Predetermining counters assure simplicity and accuracy in blending operations. Data is instantly telemetered to central locations. New G-E Telemetering. Typical blends are refrigerants, solvents and special naphthas.

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conveyors



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When it comes to your materials handling needs, it is a matter of sound economics to depend on Link-Belt, builders of industry's most complete conveyor line. In addition to this broad range of line, which permits unbiased recommendations, Link-Belt offers *quality*—achieved through engineering skills, manufacturing scope and research . . . "*experience unlimited*" in the materials handling field.

Also important, Link-Belt can provide *complete* handling systems . . . patterned exactly to your requirements with

SCREW CONVEYORS—Easily adapted to congested locations . . . operate horizontally, vertically or inclined. Link-Belt provides all components for a complete screw conveyor line. Exclusive optional *Quik-Link* feature permits fast, easy removal of any conveyor section without disturbing other components.

a background of more than 80 years of conveyor specialization. Our engineers are familiar with the particular handling needs of every industry. It's more than likely they have met—and solved—many problems similar to yours. We will design, equip and erect your entire installation . . . and accept full responsibility for its successful operation.

For full information—on single components or complete systems—large or small—contact your nearest Link-Belt office. Catalogs covering all conveyors are available on request.

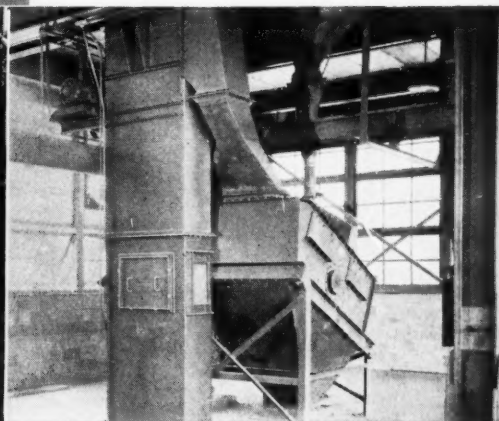
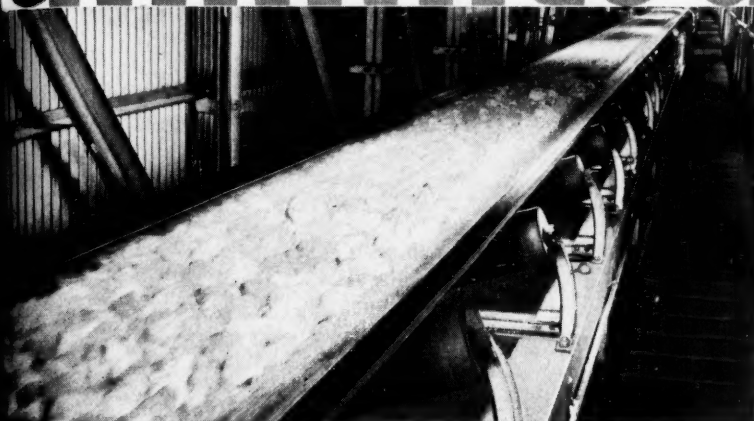
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The line that means savings, whether handling parts or bulk materials, finished products or units

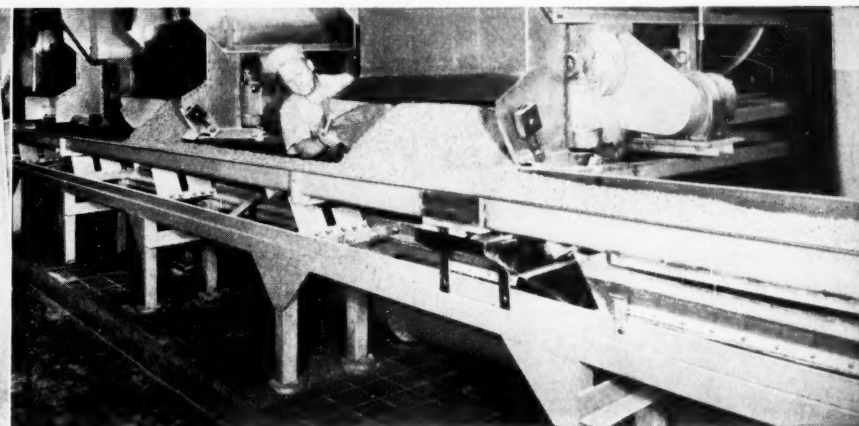
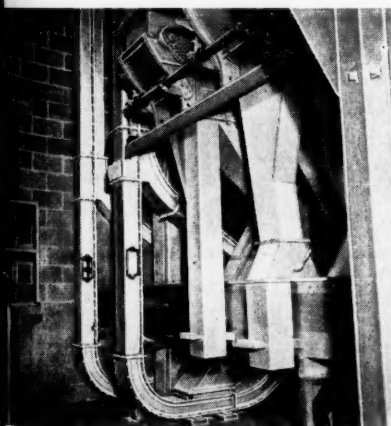


BELT CONVEYORS—Link-Belt serves as a single source for design, equipment and erection of *Job-Engineered* belt conveyors for small or large tonnages, for routes of any length. Link-Belt engineers have the selection advantage of industry's most comprehensive idler line—plus a broad range of pulleys, drives, terminal machinery and auxiliary equipment. Husky, *Pre-Bilt* sectional belt conveyors are also available from Link-Belt.

BUCKET ELEVATORS—Unlimited solutions to vertical or inclined movement of a wide variety of materials—bulk or parts. Fourteen types in four basic designs are fabricated from Link-Belt designed and integrated components—factory aligned for low-cost installation, smooth performance.

BULK-FLO—It's a feeder. It's an elevator. It's a conveyor. All in one unit. Operates horizontally, inclined or vertically. Conveying medium consists of an endless chain with cross flights operating in a close fitting casing. For a wide range of granular, crushed or pulverized materials.

OSCILLATING CONVEYORS—Whether handling fines or granules, chunks, parts or metal chips, Link-Belt's four types of oscillating conveyors—Flexmount, Coilmount, Heavy-duty Coilmount or Torqmount—provide surge-free movement of materials. All types feature *full-time positive action*, yet operate as near to *natural frequency* as possible to minimize power requirements.



LINK-BELT

15,500

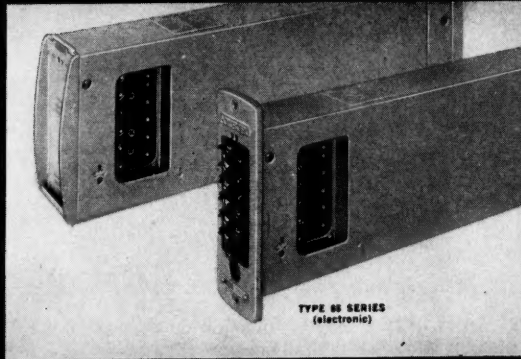
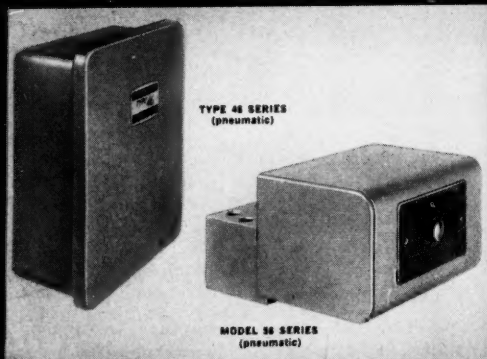
CONVEYING AND ELEVATING EQUIPMENT

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Warehouses and District Sales Offices in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs; Switzerland, Geneva. Representatives Throughout the World.

Keeping production on the move in every industry

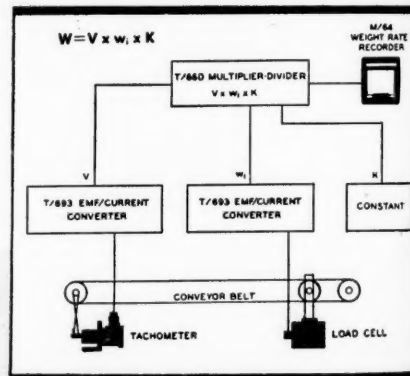
Apron conveyors	Flite-Flow conveyors
Arm and tray elevators	Oscillating conveyors
Belt conveyors	Power-and-free conveyors
Bucket elevators	Pusher chain conveyors
Bucket elevators-conveyors	Scraper conveyors
Bulk-Flo	Screw conveyors
Car-type conveyors	Sidekar-Karrier conveyors
Chain conveyors	Skip hoists
Circular carrier conveyors	Slat conveyors
Drag conveyors	Trolley conveyors
Flight conveyors	Truckveyors

new low-cost Foxboro simplify automation



FOXBORO ANALOG COMPUTING STATIONS

TYPICAL



WEIGHT RATE COMPUTATION

Gives operator continuous recording of actual weight of materials being conveyed by belt. For example, T/66D Multiplier-Divider calculates actual weight-rate from load cell and belt speed measurements.

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o Analog Computing Systems n of process mathematics

both pneumatic and electronic units available

Analog computing systems have been known and used for years. Yet their potential for increasing process efficiency has hardly been scratched.

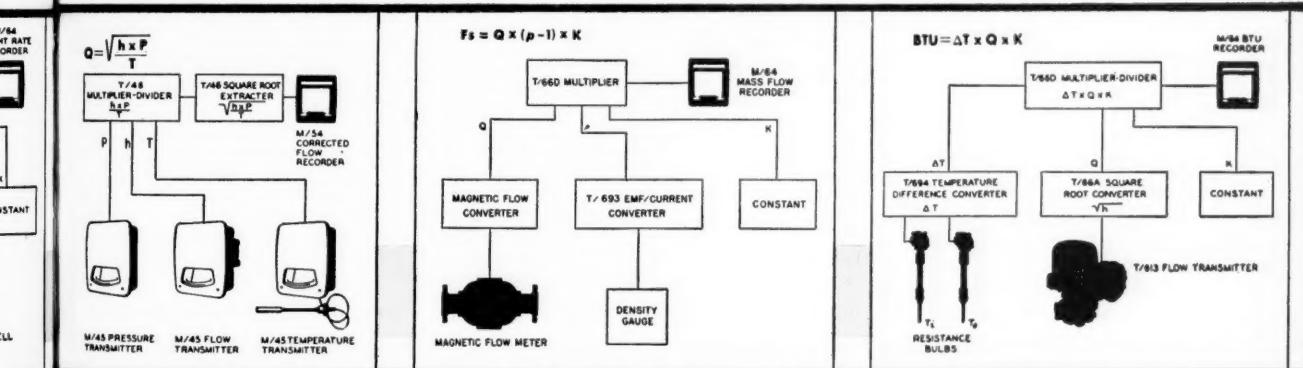
Just look what they can do! Continuous calculation of all the arithmetic functions: addition, subtraction, multiplication, division, square root extraction — in any combination. And all done automatically by a single packaged system.

And look how it simplifies the operator's job.

Instantaneous calculation . . . with records to prove it. No slide rules, no interpolation, no planimeters — and most important — no mistakes.

Because Foxboro Analog Computer Systems are relatively low-cost (\$2500-5000 average) you can "spot" them about your plant for maximum efficiency. Or, they can be grouped together at a central location to solve more complicated equations. Pneumatic and electronic systems available.

CALCULATIONS MADE WITH FOXBORO ANALOG COMPUTING SYSTEMS



GAS FLOW COMPUTATION

In common use in the Gas Industry to compensate gas flow readings for changes in line temperature and static pressure. In the pneumatic system shown here, the Foxboro T/46 Multiplier-Divider and the Square Root Extractor allow operator to read corrected flow directly.

MASS FLOW COMPUTATION

Calculates dry weight of a slurry flowing through a pipeline. In this electronic system, flow rate and density measurement are multiplied together with a Foxboro T/66D-1 Multiplier. Operator can then read flow directly in Dry-Tons-Per-Minute.

BTU COMPUTATION

Determines actual amount of heat being introduced to, or removed from, a process. Electronic system shown uses a Foxboro T/66D Multiplier-Divider to produce a signal equal to product of flow and temperature difference. Operator reads directly in Btu's.

WHAT CALCULATIONS WOULD
YOU LIKE TO AUTOMATE? ➔

FOXBORO

REG. U.S. PAT. OFF.

The Foxboro Company, 369 Neponset Ave.
Foxboro, Mass.

I have a process computation I should like to automate. Can a Foxboro Analog Computing System do it for me?

My process is.....

I want to compute.....

Name.....

Position.....

Company.....

Address.....

City..... State.....



Don't get boxed in by oxygen supply problems... let A

Maintain flexibility in your operations by removing all uncertainties about availability of oxygen for your chemical process requirements. Buy oxygen as a tonnage pipeline chemical commodity — let Airco build and operate a plant for you.

An Airco plant assures you of all the oxygen you require . . . piped to you at a steady rate . . . at a firm, fair price. And if you need nitrogen, that too is available from the air separation plant we build.

GUARANTEED BACK-UP. Your new plant is part of Airco's integrated system of supply. If your oxygen requirements increase . . . or if the oxygen plant is down for any reason, you're not squeezed. Airco will meet your needs from its nationwide network of oxygen plants. **NO CAPITAL INVESTMENT.** Airco finances the oxygen plant, whether it's on property leased from you or on our over-the-fence site. You pay only for oxygen . . . have the capital for the oxygen plant available for other

chemical
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ASSURED



ns... let Airco build and operate a plant for you

part of chemical process requirements.

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PROVEN TECHNOLOGY. Air separation is a specialized business. Airco has 45 years' experience in low-temperature technology . . . design, engineering and construction proficiency that has dotted the country with oxygen plants. There's no first-plant guesswork . . . late starts . . . long shake-down periods that ruin your production schedules.

ASSURED LOW COST. Your oxygen is available fast . . .

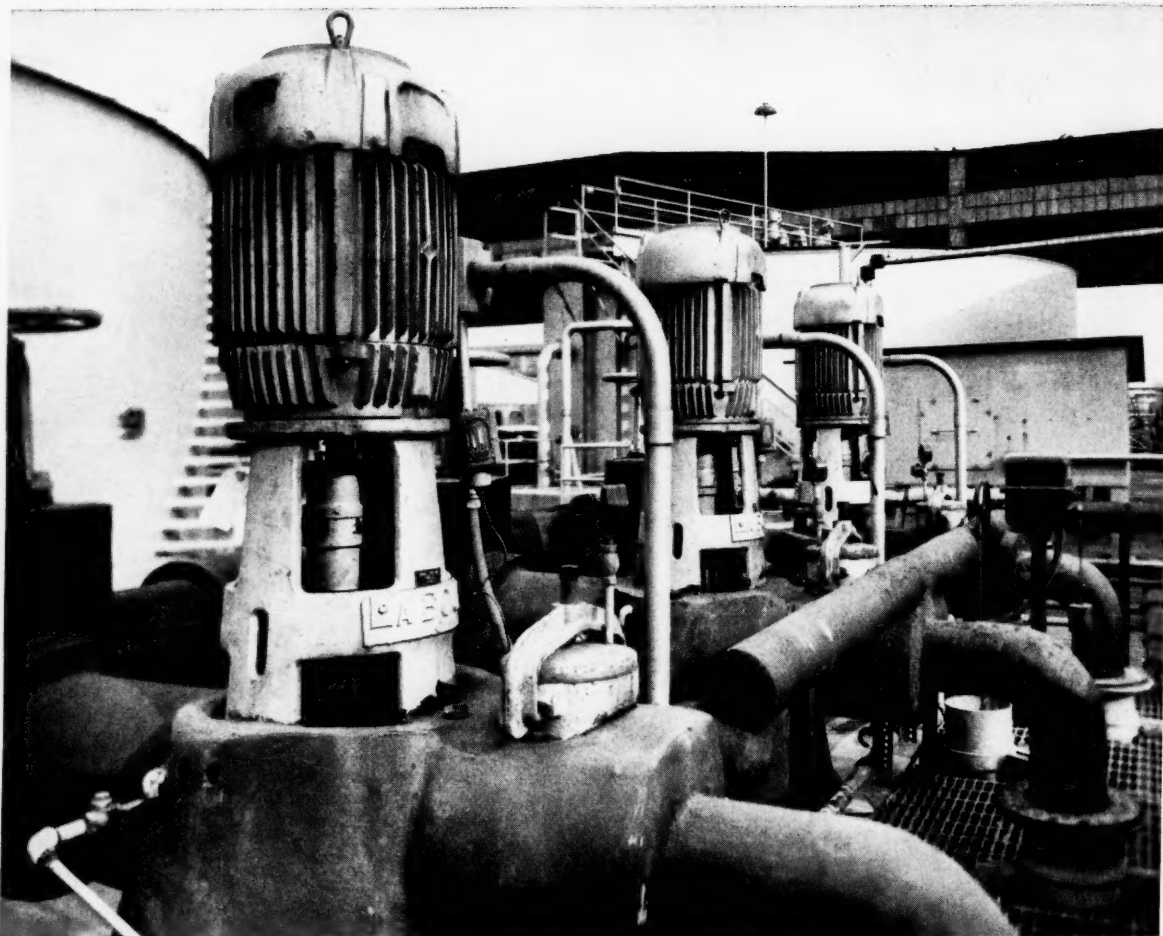
at a firm contractual price that reflects the economies provided by Airco's large resources and long experience.

For the full oxygen story, write, wire or phone today.



AIR REDUCTION

150 EAST 42nd STREET • NEW YORK 17, NEW YORK



Engineers: Floyd Brown & Associates, Marion, Ohio.

Contractors: Bay Construction Company, Sandusky, Ohio.

How to Dispose of 400,000 Troublesome Gallons Daily

Getting rid of industrial waste water containing acids, cleaners, glass particles and other assorted trouble makers at Westinghouse Electric Corporation's Mansfield, Ohio, plant is a job in which LaBour pumps play an important part.

The Mansfield plant produces home appliances from toasters to ranges and washers. Pickling and plating solutions are used in substantial volume, and porcelain enameling is also done here. Resulting wastes must be treated before the water

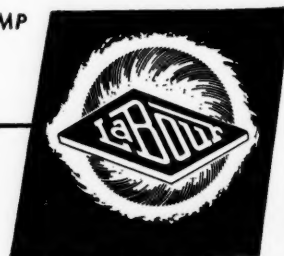
is discharged into nearby stream. There are seven LaBour pumps in the treatment plant, pumping some 400,000 gallons every working day.

Any interruption in the proper functioning of the waste treatment plant would, of course, be costly. The LaBour pumps were chosen for their known dependability and minimum maintenance requirements—good reasons why you should choose LaBours where you are responsible.

ORIGINAL MANUFACTURERS OF THE SELF PRIMING CENTRIFUGAL PUMP

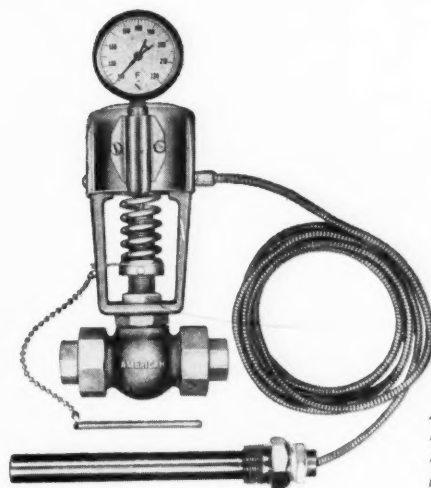
LABOUR

THE LaBOUR COMPANY, INC. • ELKHART, INDIANA
WHITE PIGEON, MICH. • LONDON, ENGLAND



immediate

AMERICAN TEMPERATURE REGULATORS begin corrective action with less than 1/10 degree change at the bulb



American Temperature Regulators are made in sizes 1/2" to 4". Temperature ranges as low as minus 15° F. to 50° F.—as high as 240° F. to 350° F.

response

You get fastest possible temperature response from these new regulators because the stem cannot bind and retard valve action.

The valve stem on American Temperature Regulators is sealed off by a friction-free bellows that makes practical a nonleaking packless valve. Also contributing to fast, stable action is the use of an extra-long preflexed adjusting spring. This spring permits a long range of temperature adjustment without disturbing valve sensitivity at normal levels.

There are other high-quality features in American Temperature Regulators: maximum use of stainless steel; standardized parts; the fewest possible components; and unitized assembly. In addition, compactness simplifies installation in "tight" locations.

Accurate temperature regulation and attention-free operation mean long-term economy. Your industrial supply distributor will gladly help you select the right American Temperature Regulators for your needs. Write for Bulletin 114A.



AMERICAN TEMPERATURE REGULATORS

A product of

MANNING, MAXWELL & MOORE, INC.

Gauge and Instrument Division • Stratford, Connecticut

Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario
Latin America: Export Division, Chrysler Building, New York, N. Y.
Europe: Manning, Maxwell & Moore, S. A., Fribourg, Switzerland

Mobilplex EP grease has good pumpability over wide ranges of temperature and shear rates. Here, Mobilplex EP is pumped through a 24-foot coil of $\frac{3}{8}$ " tubing frozen in ice at 15 F . . . remains pumpable, permits continuous delivery even at critical pumping rate.

Mobilplex EP resists both water wash and runout caused by heat. In this demonstration, an immersion heater is used to boil water in a conventional mesh vegetable strainer coated with Mobilplex EP. Grease maintains a water-tight film even under these adverse conditions.



Mobilplex EP gives extra protection against wear under heavy and shock loads. Here, two split "bearings" consisting of V-shaped bushings are clamped under equal pressure on a polished steel shaft. The front bearing is lubricated with Mobilplex EP; the rear bearing with a high quality non-EP grease. When bearings are reciprocated in opposite directions, the shaft turns with the rear bearing, indicating frictional resistance is greatest at this point.

EVALUATION SUMMARY				
MOBILPLEX EP (M) and 5 Leading Competitive EP Greases (A,B,C,D,E)				
PROPERTY EVALUATED	RATING			
	<i>Excellent</i>	<i>Good</i>	<i>Fair</i>	<i>Poor</i>
Heat Resistance	M	A	C,D,E	B
Service Performance	M	A,C,E	B,D	
Extreme Pressure	M,A,C	B,D,E		
Anti-Wear	M,A	B,C	D,E	
Rust Protection		M,B,C,D,E		A
Water Resistance		M,B,C	A,D,E	
Handling Properties		M,A,B,C,D,E		
Controlled Bleeding		M,A,C	B,D,E	
Non-staining		M	A,B,D,E	C

This chart summarizes results of an extensive evaluation program at Mobil Research. For complete details ask your Mobil representative.

The Multi-Service Grease with unique Calcium EP Complex. Never before in a single lubricant such a wide range of use . . . such a margin of superiority . . . such a potential for maintenance savings!*

Versatility unparalleled...

Mobilplex ep

A product of Mobil research . . . Mobilplex EP . . . a Multi-Service extreme-pressure grease far superior in quality and range of applications to any multi-purpose grease available.

Mobilplex EP, with a unique Calcium EP Complex, provides maximum protection against wear, rust, washout and heat. Because of its greater versatility, Mobilplex EP goes further than competitive extreme-pressure greases in simplifying your lubricant application, storage and purchasing practices. This new-type lubricant has given industrial machines greater protection while replacing as many as seven other greases. Mobilplex EP has all of the advantages usually associated with EP greases—as well as excellent storage, structural and oxidation stability.

Examination of the Socony Mobil evaluation summary at left shows that in comparison with five competitive extreme-pressure lubricants Mobilplex EP is the only grease excellent or good in every grease quality tested. No wonder aluminum and steel mills, metalworking shops, cement plants, and the chemical and rubber industries are reporting dramatic success with Mobilplex EP.

For full details contact your local Mobil representative, or write Mobil Oil Company, 150 East 42nd Street, New York 17, New York.

*Multi-Service means excellent for all types of anti-friction and plain bearings under various operating conditions up to temperatures in the range of 300 F. and for all types of dispensing equipment.



For a descriptive brochure and specific recommendations, cut out and mail on your letterhead.

Mobil Oil Company, Room 2057A

Gentlemen: Re: Mobilplex EP Grease Ad. Please have technical representative call to discuss:

- ☐ Performance results.
- ☐ A specific grease lubrication problem involving water—caustic—acid—heat—.
- ☐ Reducing the number of greases in my plant.



Proved Petroleum Products . . . Available with a Mobil Program of Correct Lubrication

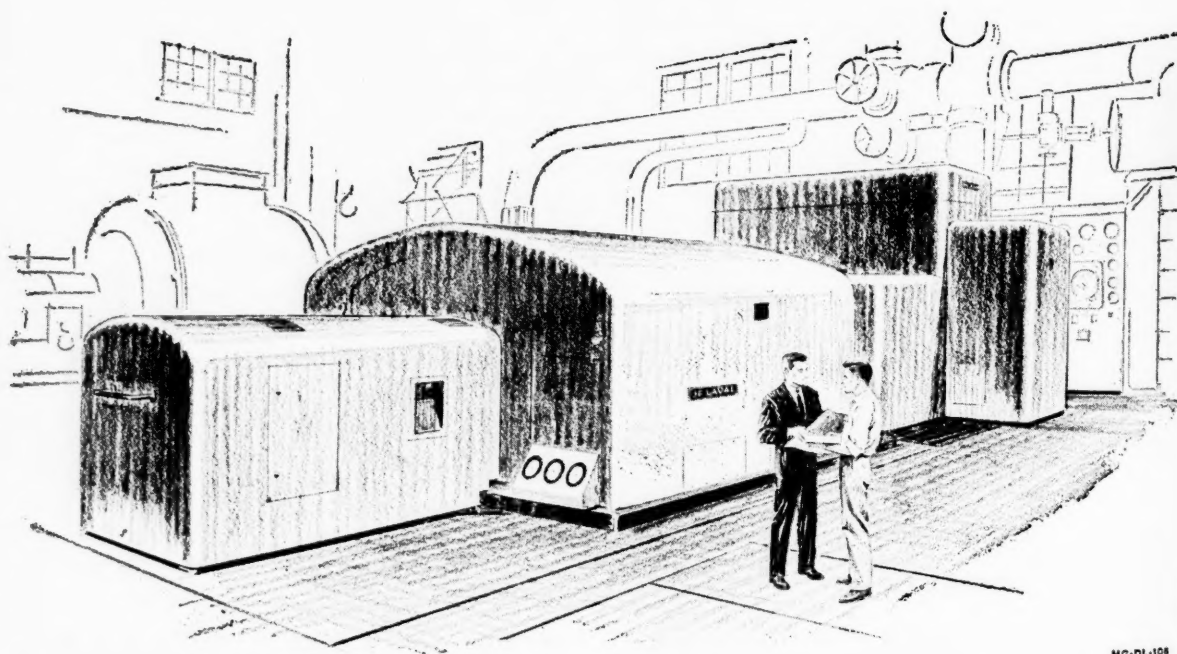
DE LAVAL
engineered
flexibility
lets a turbine "grow"

With his eye on tomorrow, a major food processor gave De Laval unusual requirements. He wanted a turbine that would meet today's power and process steam needs . . . and be capable of almost doubling its output in the future. The result: a De Laval turbine to which five additional stages can be added in the customer's plant.

Present capacity of this unit is 5,000 kilowatts which will be raised to 9,375. For future operations, steam pressure and temperature will also be sharply increased.

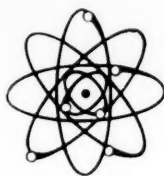
Whether you need a turbine that can "grow" or have other problems involving heavy rotating machinery, De Laval engineered flexibility can help.

De Laval Steam Turbine Company, Trenton 2, N. J.



DE LAVAL • 60 YEARS OF CREATIVITY AND QUALITY

CENTRIFUGAL PUMPS AND COMPRESSORS • TURBINES • IMO® ROTARY PUMPS AND HYDRAULIC MOTORS
MARINE PROPULSION AND AUXILIARY EQUIPMENT • HELICAL AND EPICYCLIC GEARS • TURBOCHARGERS



NUCLEAR GRAPHITE NEWS

from NATIONAL CARBON COMPANY

DIVISION OF UNION CARBIDE CORPORATION, 270 PARK AVENUE, NEW YORK 17, N. Y.

OFFICES: Birmingham, Chicago, Houston, Los Angeles, New York, Pittsburgh, San Francisco. In Canada: Union Carbide Canada Limited, Toronto

NO OTHER MATERIAL HAS SO MANY USEFUL NUCLEAR PROPERTIES

- EXCELLENT STRUCTURAL MATERIAL
- RESISTS CORROSION
- RESISTS THERMAL SHOCK
- EASILY FABRICATED
- HIGH MODERATING QUALITIES
- STRENGTH INCREASES WITH TEMPERATURE RISE

GRAPHITE CORE FOR HANFORD NPR COMPLETED BY NATIONAL CARBON



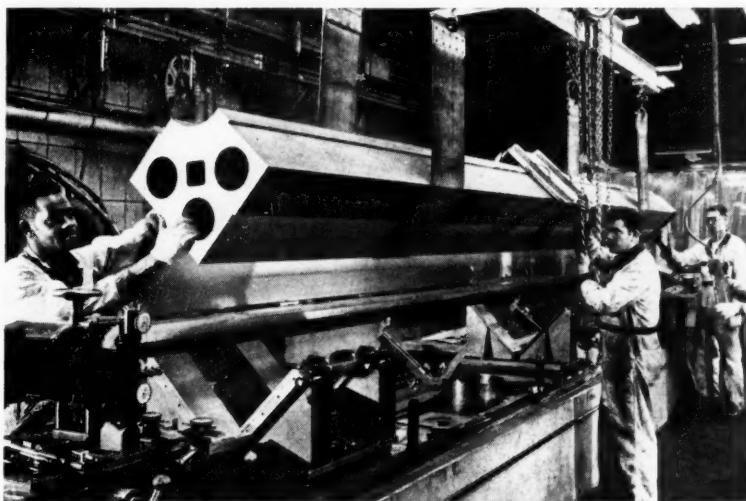
Loading last pallet of moderator bars for the NPR

The task of producing and machining 5 million pounds of high-purity nuclear graphite for the New Production Reactor at Hanford, Washington, has been completed by National Carbon Company.

The entire output was machined to close tolerances, with the thousands of moderator bars ranging in size from 2 x 3 x 48 inches to 6 x 6 x 48 inches. Total ash content was less than 10 ppm.

The New Production Reactor core is another outstanding achievement by National Carbon for the nation's growing reactor program.

4400-lb. graphite columns machined to exacting tolerances for EGCR



Swinging near-20-foot-long EGCR moderator column of "National" nuclear graphite into position for inspection after boring of fuel channels through entire length.

Machining by National Carbon Company of 120 graphite moderator and reflector columns comprising the Experimental Gas Cooled Reactor for the AEC at Oak Ridge, represents a major accomplishment in the production of nuclear components.

General machining specifications for the giant-size columns, designed for the 15-foot, 10-inch diameter core of the EGCR, called for a 125-microinch surface finish. The columns are the longest pieces of nuclear graphite ever produced.

Each moderator column, before machining, measured approximately 20 feet long by 17½ inches square, and weighed some 4400 pounds. Initial machining reduced each column to 16.3 inches square by 19 feet, 4

inches long, with final weight ranging from 2250 to 3600 pounds.

Aside from the boring of numerous precision holes of varying diameters and lengths—such as experimental, control rod, and flux scanning channels; neutron source and thermocouple holes—the most remarkable feat of machining was the boring of the fuel channels. In this operation, 234 holes, 5.25 inches diameter, were bored through the entire length of the columns, with hole diameter held within 0.030-inch, and hole location at each end within 0.010-inch.

After completion of precision machining, each piece passed a purity and flexural load test and was carefully packaged and safely delivered to the customer's plant site.

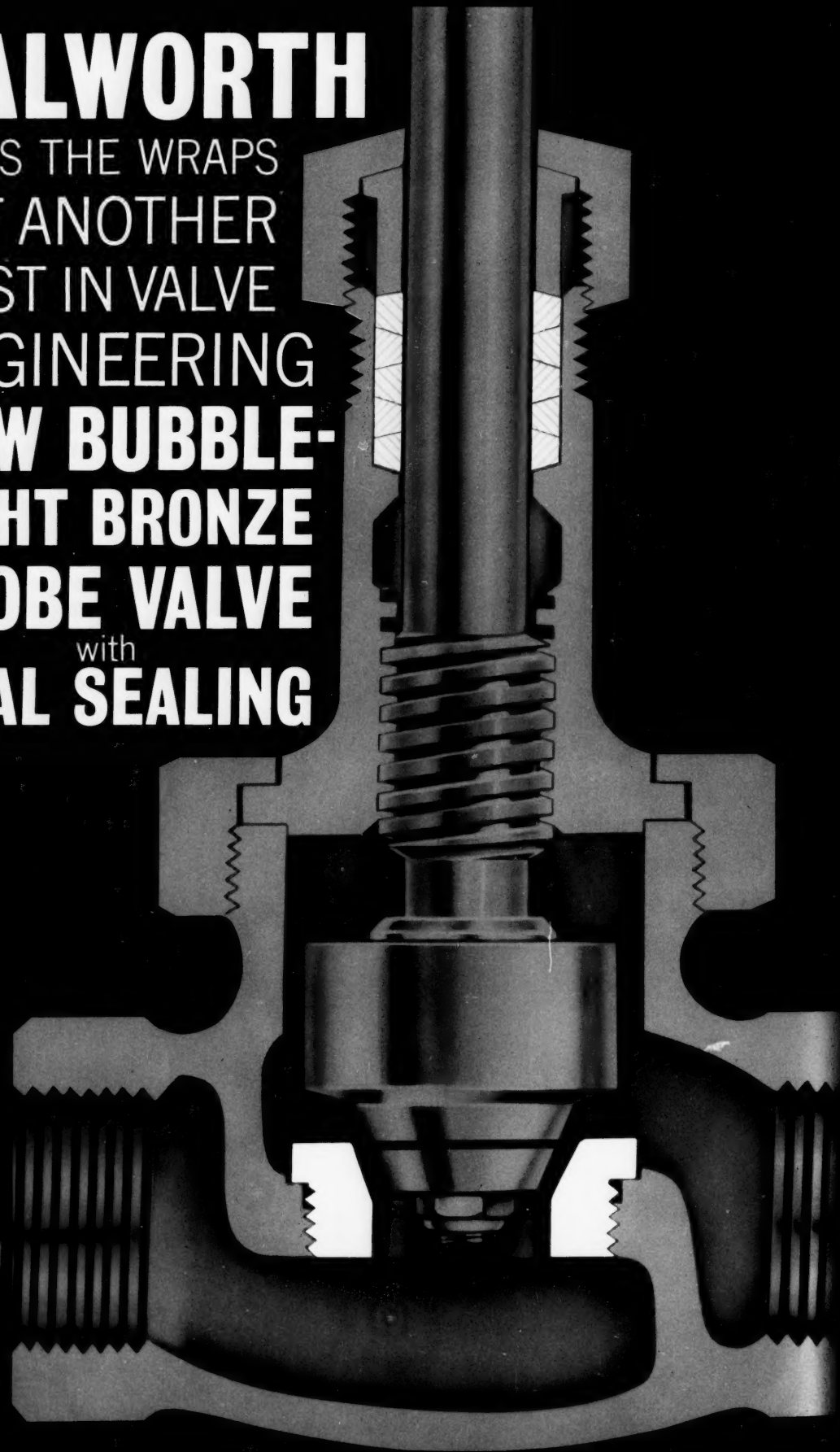
"National" and "Union Carbide" are registered trade-marks for products of

NATIONAL CARBON COMPANY



WALWORTH

TAKES THE WRAPS
OFF ANOTHER
FIRST IN VALVE
ENGINEERING
**NEW BUBBLE-
TIGHT BRONZE
GLOBE VALVE**
with
DUAL SEALING



ABSOLUTELY BUBBLE-TIGHT!

Here's the newest concept in valve design. Resilient unplasticized resin insert gives absolute shut-off in critical piping—at low torque. Now available for your particular requirements, the new Walworth Bubble-Tight Bronze Globe Valve is already in service aboard nuclear submarines, and in cryogenic gas piping systems—and is particularly suitable for the most critical water, oil and gas piping systems.

DUAL SEALING This unique unplasticized resin insert provides full 360° seal against matching monel seat. Secondary metal-to-metal seating further assures tightness... consistently. Write for descriptive bulletin.



WALWORTH

750 THIRD AVENUE, NEW YORK 17, NEW YORK



The Walworth Companies: Alloy Steel Products Company ■ Conoflow Corporation ■ Grove Valve and Regulator Company ■ M&H Valve and Fittings Company ■ Southwest Fabricating & Welding Co., Inc.

"LET ME SHOW YOU HOW DU PONT CAN CUT YOUR MAINTENANCE COSTS!"

Meet Frank Smith, shown here on the job. A member of Du Pont's nationwide team of Technical Service experts, Frank's job is to see that you derive maximum returns from every paint dollar you spend.

"A true low-cost approach to maintenance painting," explains Frank, "hinges on two factors of equal importance: paint quality and job suitability. You get both with Du Pont. Take the problem of severe corrosion brought on by acid spillage, fumes and vapors. In-use evaluations at paper mills, refineries, bleacheries and chemical plants prove there's no finer finish for this purpose than our new IMLAR^(TM) Vinylmastic Coatings and Vinyl Enamels.

"But that's just one example. Whatever your problems, you can be sure the finishes used meet your needs exactly. It's all a part of our planned technical assistance—a valuable bonus you get when you specify Du Pont's system of maintenance painting. It means going right into your plant and working out a sound program of paint maintenance geared for efficient, long-range protection at lowest cost per square foot per year!"

Over 13 years' experience with corrosion problems makes Frank Smith typical of the able, expert help you can expect from Du Pont. Why not call your local Du Pont district sales office the next time you have a corrosion problem? For facts on the finishes mentioned here, just clip and mail the coupon below.

E. I. du Pont de Nemours & Co. (Inc.)
Finishes Division, Department CE-19
Wilmington 98, Delaware

- ☐ Please send me, without obligation, technical bulletin on IMLAR.
- ☐ Please have Du Pont Technical Representative schedule a call.

Name _____

Firm _____

Address _____

City _____ Zone _____ State _____

MAINTENANCE PAINTS



BETTER THINGS FOR BETTER LIVING...THROUGH CHEMISTRY



Engineering Research is the backbone of Elliott developments in centrifugal compressor design. Persistently exploring new paths to broader application flexibility, better operating efficiency, increased reliability, Elliott compressor research engineers study aerodynamic, thermodynamic, mechanical, metallurgical and related subjects to improve and perfect the performance of Elliott compressors. **ELLIOTT COMPANY**





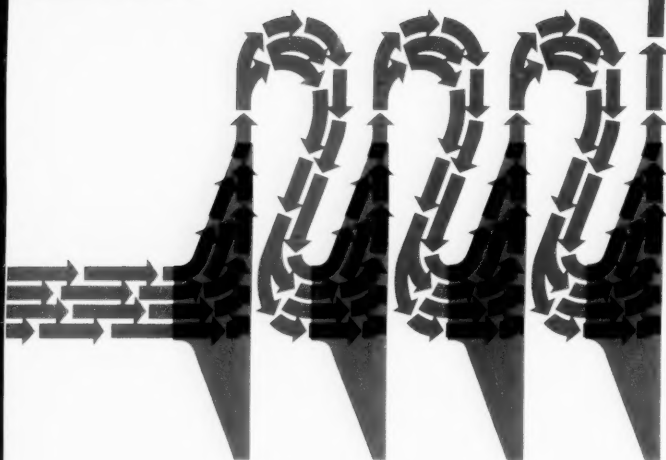
TOMORROW'S COMPRESSOR

IS BEING DEVELOPED

HERE This is a part of the Elliott compressor development facility—a highly-sophisticated proving ground for new ideas.

With the research equipment pictured here, new compressor wheel designs, new diffuser and return channel patterns, new inlet and discharge geometry can be evaluated. A multiplicity of temperature and pressure probes report conditions at test stations from inlet to discharge. Compressor components under study can be operated as an open air system or as a closed loop.

The knowledge gained with this and other unique research facilities will assure continued advances in the design and application of Elliott compressors.



This is one of the Elliott machines now in service into which has been incorporated fundamental basic knowledge already gained through the use of the above facility.

ELLIOTT COMPANY

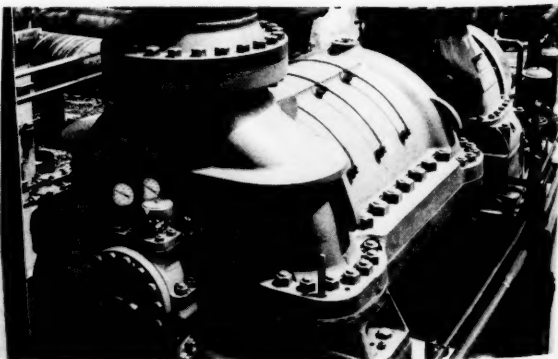
ELLIOTT THE MOST COMPLETE LINE OF
**INTEGRATED COMPRESSOR
& DRIVER UNITS** 500 cfm to
600,000 cfm



GENERAL OFFICES:
JEANNETTE, PA.

PLANTS AT:
Jeannette and Ridgway, Pa.;
Springfield, Ohio

TURBINES • GENERATORS • MOTORS • COMPRESSORS •
TURBOCHARGERS • EJECTORS • STRAINERS • TUBE CLEANERS



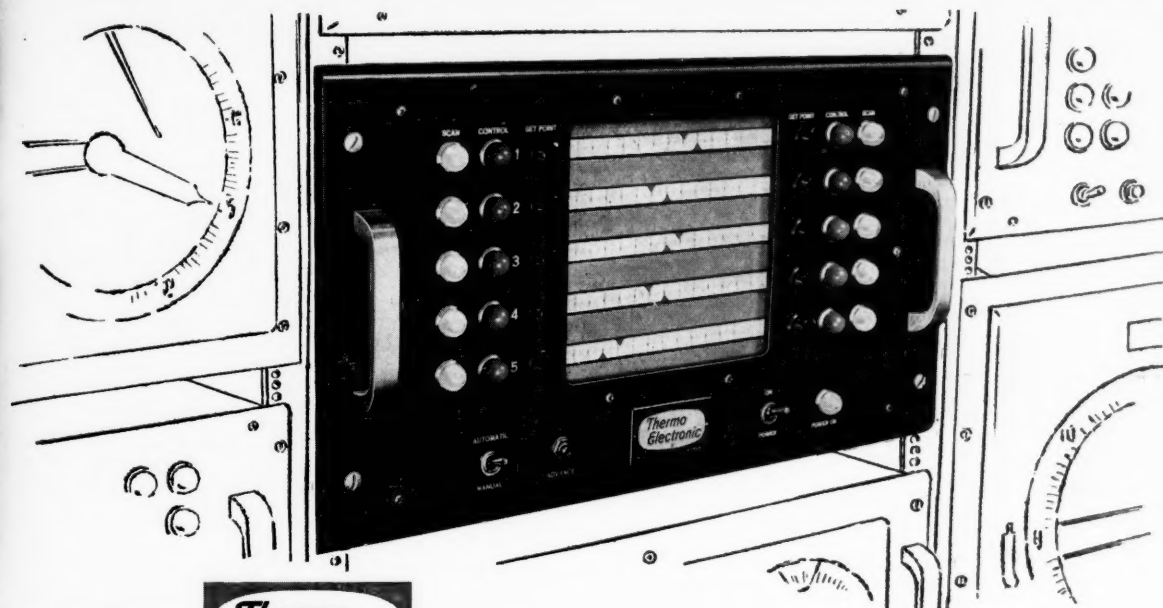
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CHEN



ONE **Thermo Electronic** Multi-Point Controller Controls TEN Process Temperatures

One, compact "Thermo Electronic" Multi-Point Controller gives you, sensitive, accurate, automatic . . .

- Two position (off-on) control of up to ten separate process temperatures; also controls flow, pressure, pH, Strain gages, and other operations.
- Three position control of five separate processes!
- Single point constant control of any critical process!
- Manual-Balance Indication of exact process conditions!
- Monitoring of extra points or those already under control!

Ten in One

One instrument does the job of ten individual controllers. You save—40 to 60% of initial cost—up to 75% of panel space—cut installation time and cost—minimize maintenance!

Clean, Simple, Functional Design

The "Thermo Electronic" Multi-Point Controller has front-set controls for easy operation. Routine maintenance is also done from the front, without removing unit from panel or relay rack. Available in either potentiometer or bridge measuring circuits, with an extremely stable constant voltage supply, the instrument provides long-lived, trouble-free control of practically every process suitable to off-on control action. Sensitivity is 15 microvolts independent of scale span—Accuracy is $\pm 0.5\%$ of scale span.

**Thermo
Electric**

*Temperature
Measuring Systems
and Components*

Operation

Sensing element input signals are compared, in sequence, to individually adjustable slide-wire set-points. Signal deviations are amplified by the "Thermo Electronic" high-gain relay control amplifier, and used to actuate load relays connected to the points being controlled.

Scanning sequence is governed by a stepping switch and electronic timer. Scanning rate—3 seconds per point. Other scanning speeds are available by simply changing one carbon resistor.

Ten white lights on the instrument panel show scanning position—ten red lights show process condition. Ten knobs permit adjustment of individual set-points on the range scales. Ranges are available for thermocouples, resistance temperature detectors and other types of suitable transducers.

Maintenance is Easy

The instrument slides forward on built-in tracks. Simple adjustment and inspection is easily accomplished from the front. The plug-in or screw-terminal components are easily replaced—fully protected from dirt and corrosive atmosphere. The whole instrument is gasketed to further protect components.

Safety Engineering

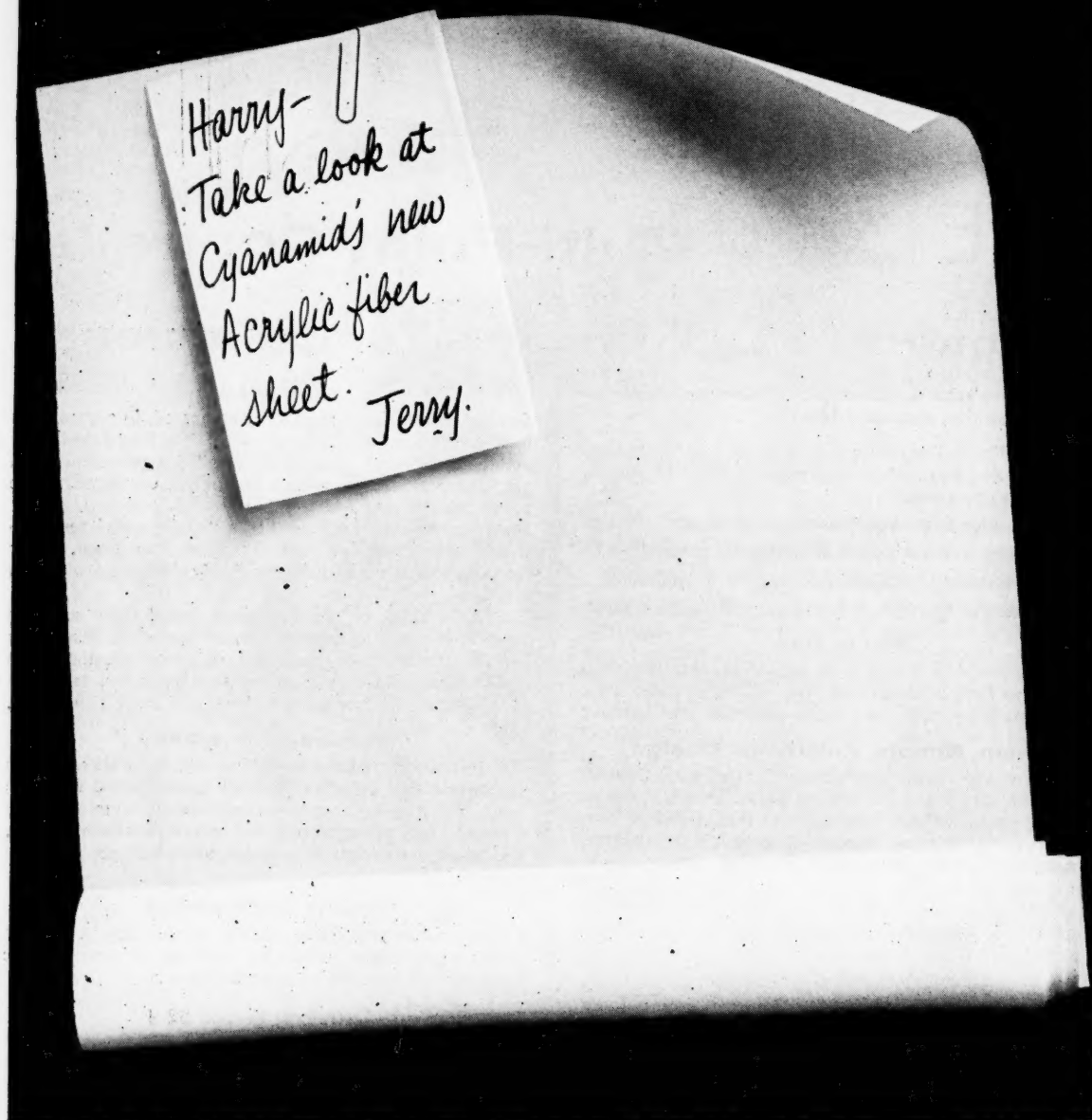
Critical circuitry is fused against overloading. A failsafe circuit is provided to protect processes against thermocouple burn-out and amplifier component failure.

Write today for Instrument Section 52-4

THERMO ELECTRIC Co., Inc., Saddle Brook, New Jersey
In Canada: THERMO ELECTRIC (Canada) LTD., Brampton, Ont.

CYANAMID

Chemical Newsfront



NO BINDER NEEDED. This new 100% Acrylic Fiber Sheet is resistant to rot, common solvents, most chemicals, and ultraviolet light. It has good electrical properties and is compatible with most coating and impregnating resins. Its hydrophobic nature and resultant good dimensional stability makes this material adaptable to a wide range of new uses. Use the coupon for detailed information.

(Paper Chemicals Department)



ELECTROLUMINESCENCE: TOMORROW'S LIGHT. The newest word for light is Cyanamid's CYANOCEL* chemically modified cellulose. A cyanoethylated, highly refined cellulose, CYANOCEL is the most efficient dielectric carrier for the filling in the "light sandwich" that makes possible lights without heat, glare or moving parts. In the future, it may be fabricated into walls, ceilings and even curtains to give a cool, uniform light. The picture above shows miniature furniture set up before 10 x 14" GE panel lamps.

*Trademark

(Petrochemicals Department)



UNLOCKING POLYMER INSOLUBILITY. Thanks to copolymerization with Cyanamid's N-t-Butylacrylamide (t-BAM), vinyl monomers (whose polymers are ordinarily incompatible with alcohol) can produce polymers which are alcohol soluble. Such resins containing t-BAM can be applied from alcohol solutions—even in spray-can formulations. t-BAM is available commercially as a free-flowing wet cake or as a dry powder.

(Market Development Department)

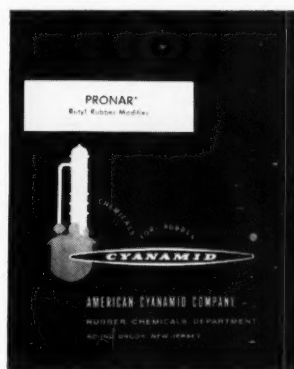
CYANAMID

AMERICAN CYANAMID COMPANY
30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

WHITE BUTYL RUBBER—THANKS TO PRONAR. Cyanamid's new PRONAR* butyl rubber modifier is a highly-active, non-discoloring, low-cost modifier that makes possible the heat treatment of white and light-colored butyl. Possible applications: in white side walls, housewares, wire and cable. For the full PRONAR story, send for Cyanamid's booklet by checking the appropriate area on the coupon.

(Rubber Chemicals Department)

*Trademark



For further information on products in this advertisement wire, or mail this coupon to: **CE-91**

AMERICAN CYANAMID COMPANY
30 Rockefeller Plaza, New York 20, N. Y.
Dept. 6365

Please send me additional information on

- ☐ ACRYLIC fiber sheet
- ☐ CYANOCEL chemically modified cellulose
- ☐ N-t-Butylacrylamide
- ☐ PRONAR butyl rubber modifier

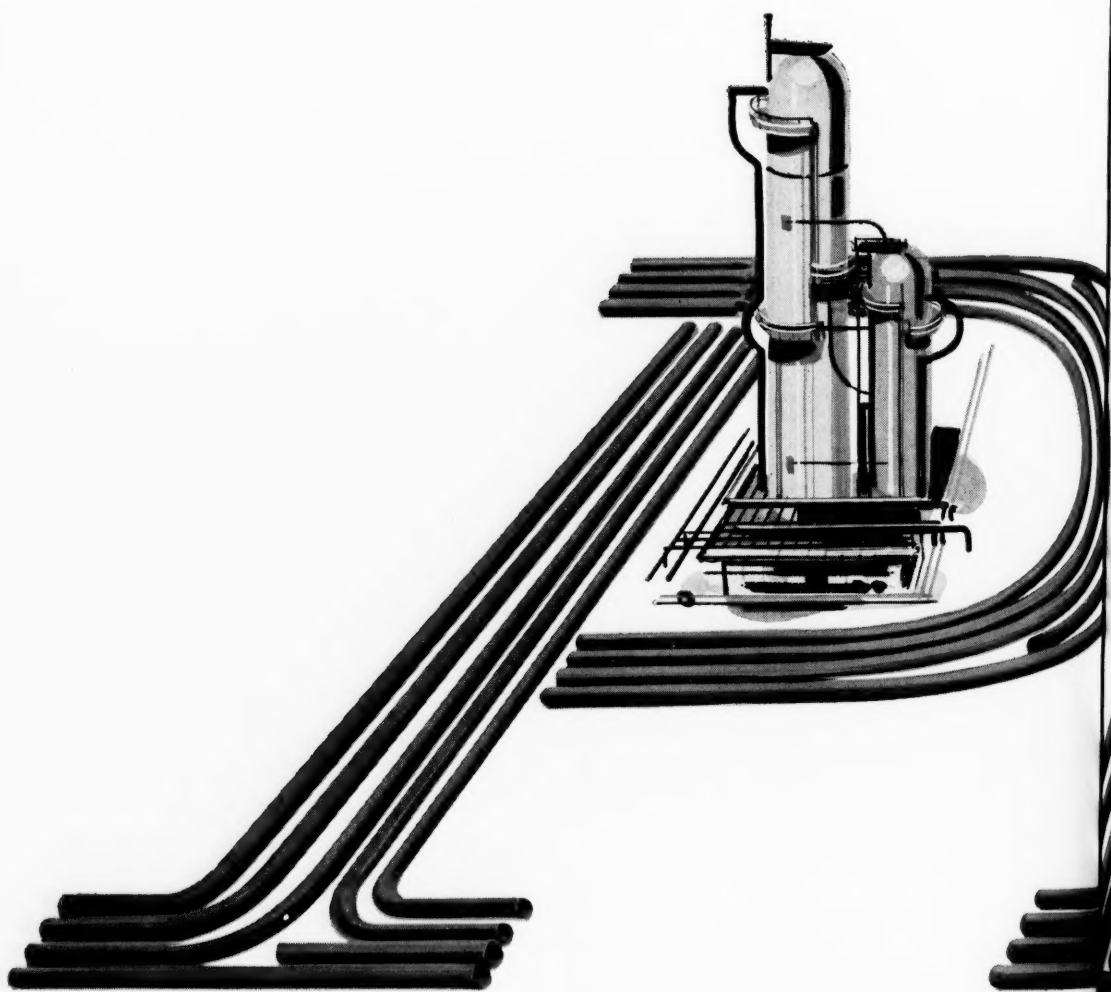
Name _____

Company _____

Position or title _____

Address _____

City _____ Zone _____ State _____



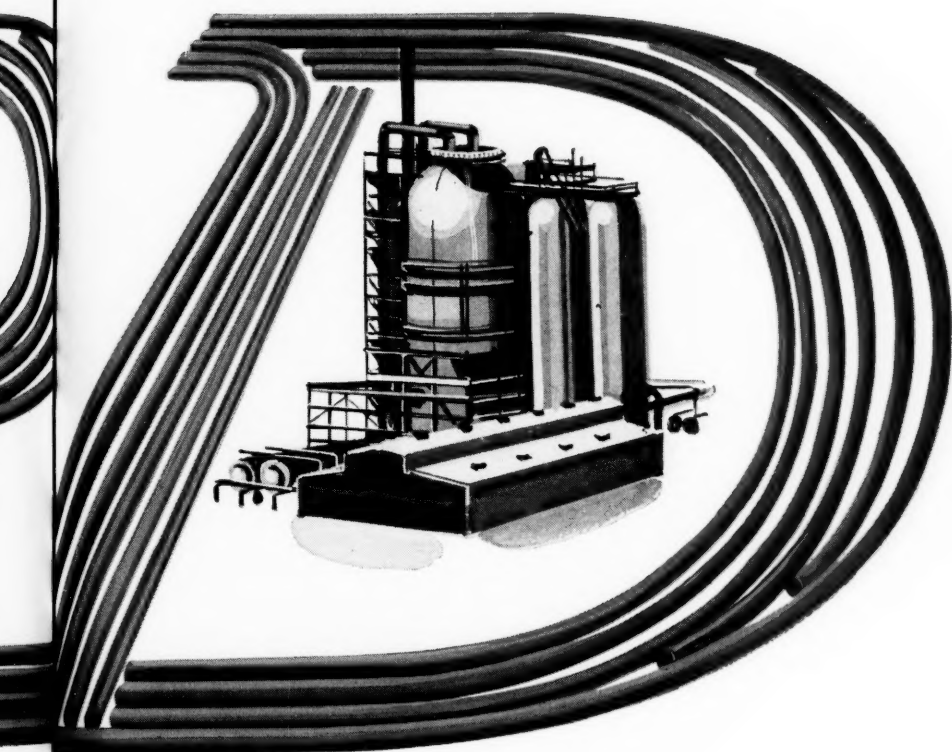
Put long run reliability into your performance picture...w

■ Wide line of finest quality copper-base alloys for every type of heat exchanger, condenser, evaporator, cooler and feed-water heater need—including Admiralty and Cupro-Nickel combinations.

■ Nationwide warehouses, completely stocked in Houston, Beaumont and Corpus Christi, Texas, Baton Rouge and Lake Charles, Louisiana, Tulsa, Los Angeles and South Brunswick, New Jersey, to serve customers from coast to coast.

■ Experienced personnel to handle all kinds of inquiries, determine specific requirements and specify the best material for the job.

CHEM



...with Phelps Dodge copper-base alloy tubes!

rely sto
pus C
Charles
swick
past.

■ Expert engineering service to help solve all kinds of tube corrosion problems, determine the exactly correct alloy for your specific application.

Specify the best—at the same cost as the rest!

PHELPS DODGE COPPER PRODUCTS CORPORATION

SALES OFFICES: Atlanta, Birmingham, Ala., Cambridge, Mass., Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Dayton, Denver, Des Moines, Detroit, Fort Wayne, Honolulu, Houston, Indianapolis, Jacksonville, Kansas City, Mo., Los Angeles, Memphis, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Ore., Richmond, Rochester, N. Y., San Francisco, St. Louis, Seattle, Tampa, Washington, D. C.





Only **TOTE*** meets the Big 3 needs of cost conscious *BULK* handlers

■ *For the efficiency and economy of automation* ■ *For the flexibility and versatility of unit containers* ■ *For the product protection of sealed containers.*

Tote is a complete, mechanical, automatic bulk handling system based on metal containers (aluminum, stainless steel, carbon steel, monel or magnesium) plus filling and discharging equipment. It is designed to handle—and does handle for a large and diverse list of aggressive, cost-conscious bulk handlers—an almost unlimited list of materials.

Compare Tote System with bulk-handling methods using bags or fiber drums. Tote System's labor savings alone, resulting from reduced handling time, range between 8 cents and 25 cents per hundredweight of material handled. Tote System also enables you to take advantage of bulk discounts and to eliminate recurring container costs. It virtually eliminates product loss due to siftage, breakage and incomplete dumping; saves warehouse space; and saves freight damage claims.

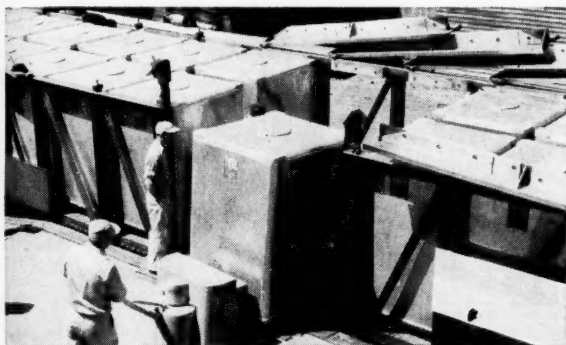
In addition, Tote System protects product quality. Once inside the Bin, the product is sealed against water, gases, odors, dust or other foreign material, insects and rodents.

Now compare Tote System with a "push button" system using fixed storage bins. Tote System gives you the efficiency you want: compact storage; automatic weighing, blending and packaging; surge capacity between processing and packaging. Tote permits the use of a minimum conveyor system, requiring a minimum of clean-up and maintenance.

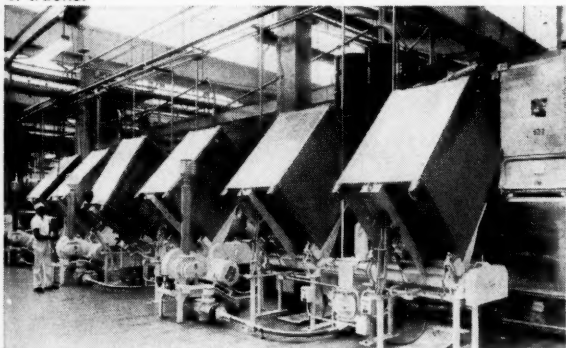
The labor cost of operating a Tote System is no greater than that of a fixed storage bin system, while the installation cost is much less.

At the same time, Tote System retains the flexibility and versatility of unit containers. They can be adapted at minimum expense to changes in plant layout and procedures. And the Bins can be used interchangeably for different products.

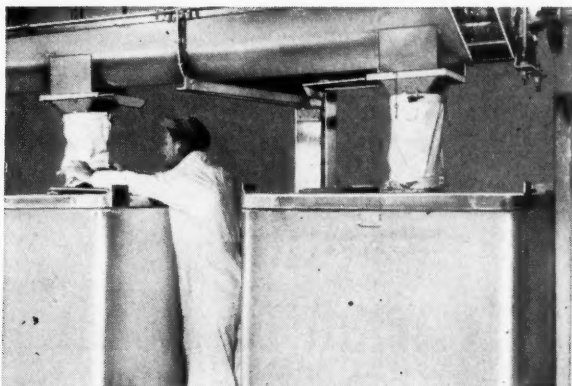
Here's how TOTE SYSTEM operates



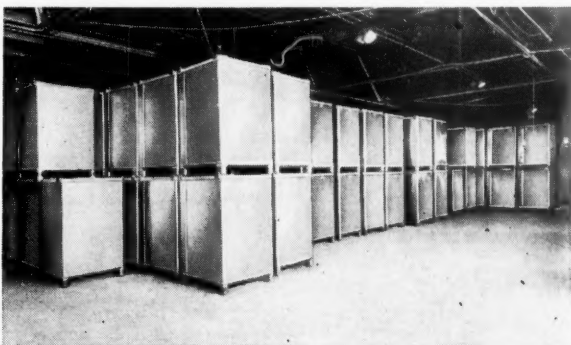
TRANSPORT: Movement of Tote Binned material may be by rail, truck or waterway. (When moved in specially designed Tote Container cars, no freight costs accrue on the bins.) Or Tote Bins may be left in-plant and filled from bulk rail cars or trucks.



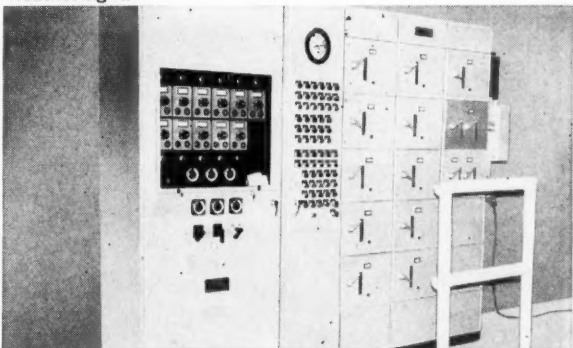
DISCHARGE: Bulk material is discharged automatically on one or a battery of Tote Tilts. Special types of Tilts and special types of Bins can be furnished to meet individual discharge needs.



FILL: A Tote filling station, designed to meet each individual need, may range from a single, straight gravity discharge chute to a multiple-outlet, automatically operated installation.



STORE: Tote Bins are moved easily with a fork or pallet lift truck. If ceiling height permits, they may be stacked. Even without stacking, they save warehouse space. Tote Bins may also be stored outdoors because they are completely weather-tight.



AUTOMATE: Discharge and mixing of Tote Binned materials can be completely automated. The control panel shown here is programmed to weigh 12 ingredients from multiple Tote Tilts into one mixer.

"See us at the Chem Show"
Twenty-eighth Exposition
of Chemical Industries
Nov. 27 to Dec. 1
Booths 856-858-860
N Y C Coliseum

TOTE SYSTEM

600 So. 7th, Beatrice, Nebraska
Division of Hoover Ball and Bearing Co.



*It will pay you
to investigate Tote.
Write for new 32-page
report on Tote.
It's free.*

* Tote and Tote System
Reg. U. S. Pat. Off.



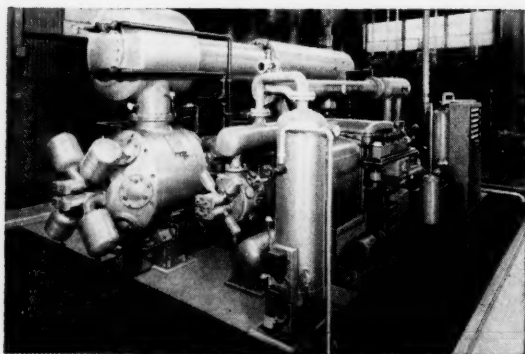
**experience
and
attention to detail**

...your assurance of

PROCESS COMPRESSOR PERFORMANCE

There's a CP Compressor exactly right for your needs, evolved from 60 years of experience in design and manufacture. Take the Class FE horizontal, balanced-opposed machine for example . . . you have a choice of many crankthrows, cylinder arrangements and staging that will give you the perfect compressor for any process requirement.

Other CP Compressors from 7½ to 5,000 hp. For vacuum service and for pressures to 15,000 psig. . . motor or steam drive.



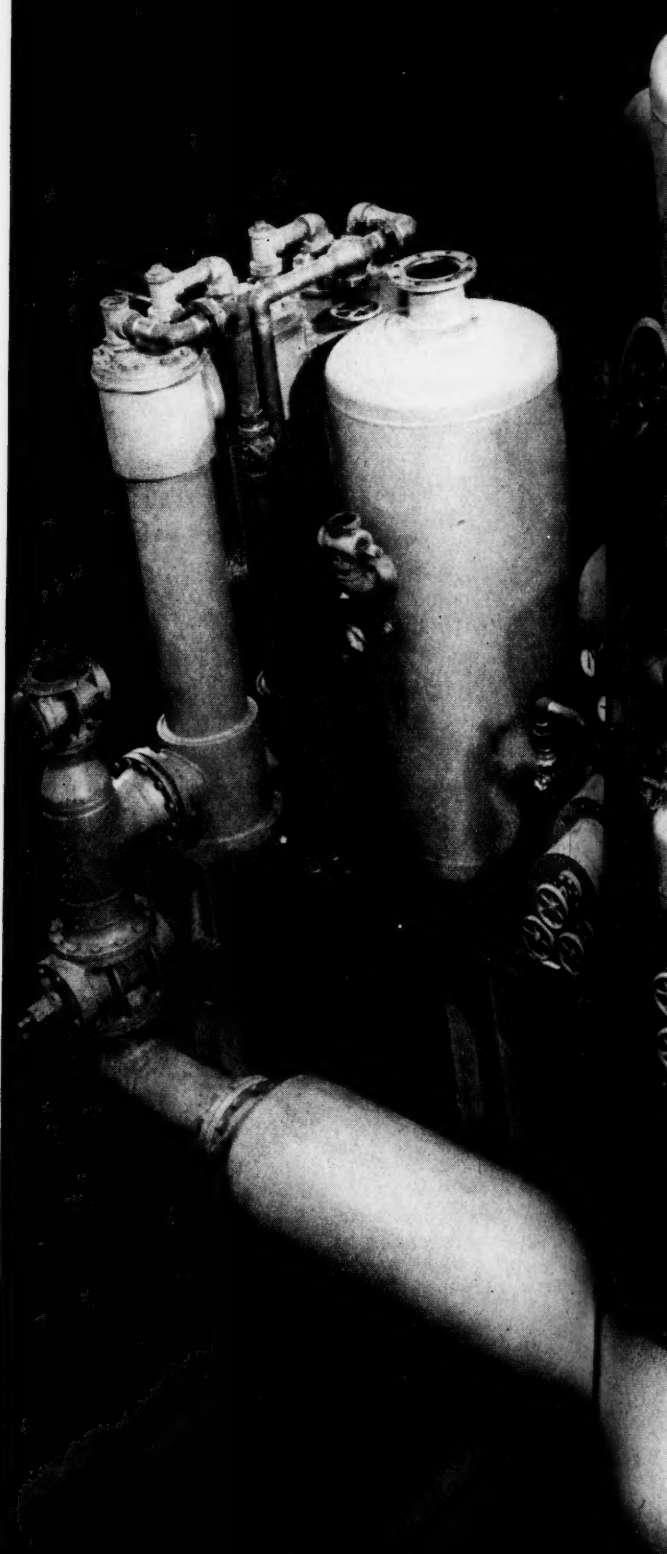
Class FE-44 horizontal, balanced-opposed, 4-stage compressor, in liquifaction service.

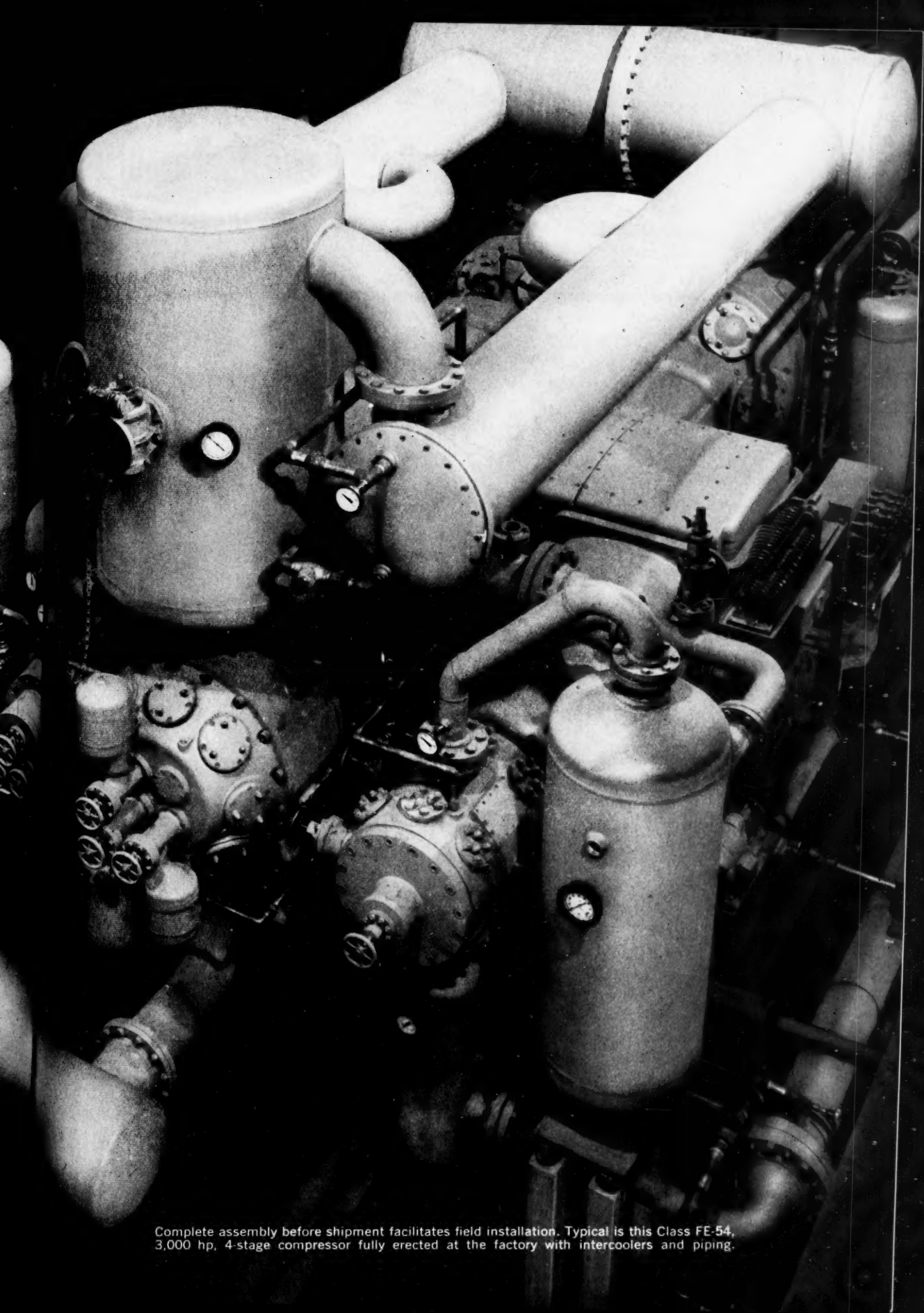


Chicago Pneumatic

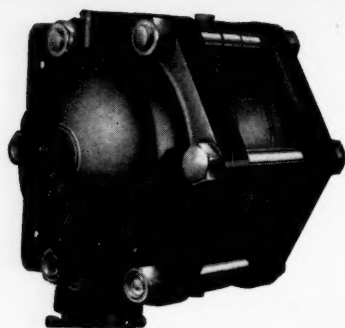
8 East 44th St., New York 17, N. Y.

AIR AND GAS COMPRESSORS • VACUUM PUMPS • PNEUMATIC TOOLS
ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS





Complete assembly before shipment facilitates field installation. Typical is this Class FE-54, 3,000 hp, 4-stage compressor fully erected at the factory with intercoolers and piping.



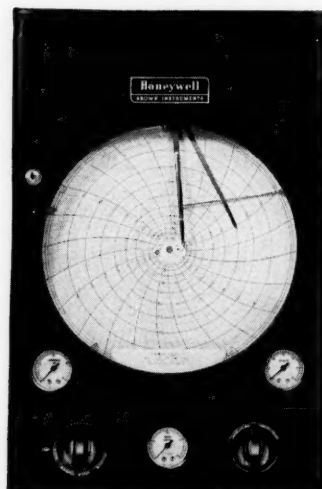
Honeywell Bellows Meter brings new

Six of many ways you can use the bellows meter



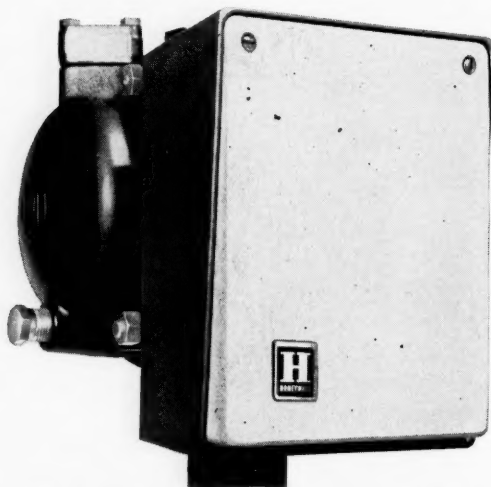
As a Recorder or Integrator—Recorders can have one, two or three pens, with the second and third pens actuated by thermometer or pressure elements. A single-pen recorder is shown above. You can get integration, too.

Write for Specification S 292-2a.



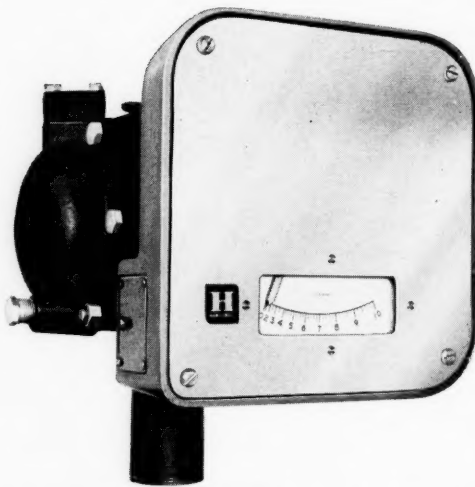
As Recording Controllers—You can get recorders with pneumatic ON-OFF, 10% Throttlor, 150% Throttlor with manual reset, or Air-O-Line (150% proportional band-plus-automatic reset) control. A single-pen pneumatic controller with integral bypass is shown above.

Write for Specification S 292-2a.



As a Non-indicating Pneumatic Transmitter—Use this non-indicating transmitter when you don't need indication at the point of measurement, and when the measured variable is to be transmitted to remotely located instruments.

Write for Specification S 230-1.

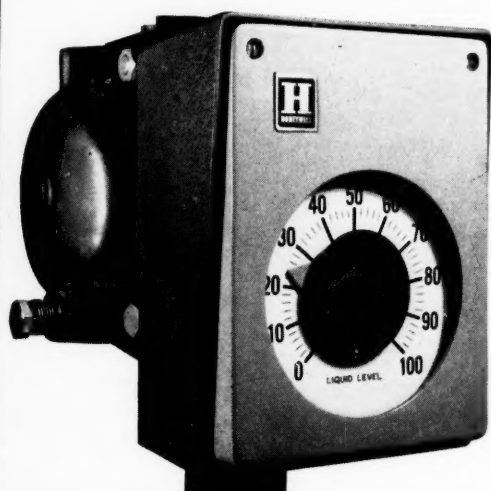


As an Electric Transmitter—You can use this *ElectriK Tel-O-Set* electric flow and liquid level transmitter with indicators, recorders, and controllers, with data handling systems, or with millivolt receivers. Field indication, as shown, is optionally available.

Write for Specification FS 301-7.

new versatility to flow or liquid level measurement

ter



As an Indicating Pneumatic Transmitter—Gives you indication at the point of measurement, plus pneumatic transmission. Easy-to-read scale, and large indicating pointer. Case is only 4 by 7 by 9 inches.

Write for Specification S 230-1.



As a Dial Indicator—Six-inch dial indicator gives easy, accurate readings at point of measurement. This meter-indicator is designed specifically for field indication.

Write for Specification S 224-1.

You can use the Honeywell Bellows Flow Meter as a recorder, controller, indicator or transmitter . . . pneumatic or electric. Use it for accurate, low-maintenance metering of flow—for steam, water, gas, oil or other fluids—or for liquid level measurement. In all of its many forms, with all of its performance advantages and operating economy, it is the most advanced flow and liquid level meter available today.

Some outstanding features:

Stability—The meter body will operate over an ambient temperature range of -40° to 250°F . Over a range from -32° to 150°F , the accuracy will not change more than 0.5%.

Leakproof construction—Hydraulically formed stainless steel bellows eliminate any chance of leakage between fill and process fluid.

Quick, easy damping—Rectangular orifice pulsation check varies the speed of response over a ratio of 20 to 1. Adjustment is essentially linear and can be made from outside the meter body while the instrument is operating.

Sensitivity and accuracy are well within the required limits of measurement and control on applications for which these instruments were designed.

Convenience—Change range easily in the field by replacing a single range spring assembly. The meter body is self-venting when measuring liquids and installed below the flow line; self-draining when measuring gas and installed above the flow line.

There are models of the Honeywell Bellows Flow Meter available in many ranges, for every application. Your nearby Honeywell field engineer can give you complete details and help you select the correct model for your application. Call him today.

MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa. In Canada, Honeywell Controls, Ltd., Toronto 17, Ontario.

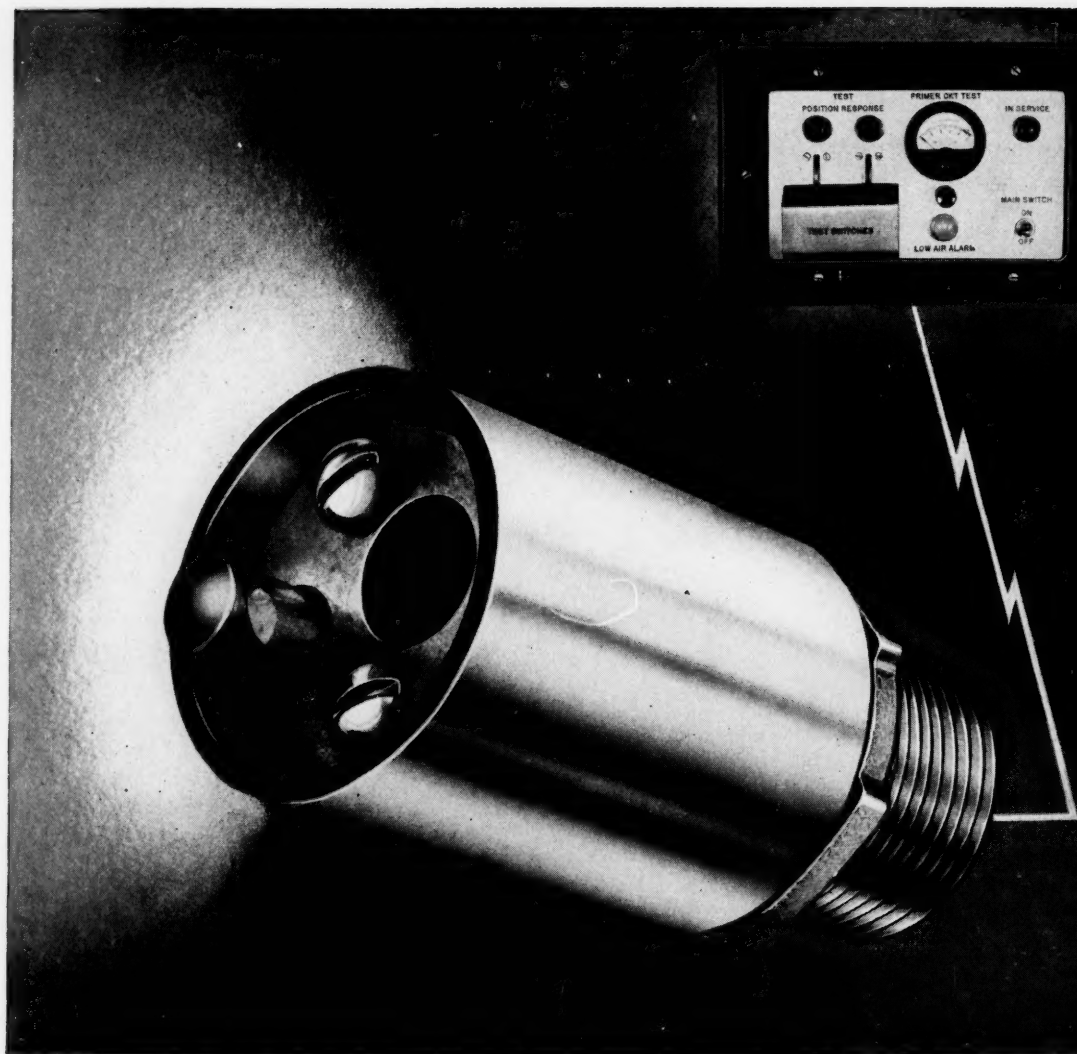
Honeywell



First in Control

SINCE 1885

HONEYWELL INTERNATIONAL Sales and Service offices in all principal cities of the world. Manufacturing in United States, United Kingdom, Canada, Netherlands, Germany, France, Japan.



NEW! SPEED-OF-LIGHT FIRE DETECTION WITH GRINNELL'S NEW PRIMAC FIRE-

New Grinnell system detects fire in milliseconds . . . offers ultra-high-speed protection where solid propellants, other materials present special hazards

Manufacture and use of solid propellants present special fire hazards. Fire protection must be ultra *fast*, if it's to be effective!

Grinnell's Primac fire-control system operates in milliseconds. A photosensitive cell picks up the first light from a fire . . . transmits a signal that actuates the new Primac water-control valve



FASTEST-ACTING SPRAY PROTECTION FIRE-CONTROL SYSTEM

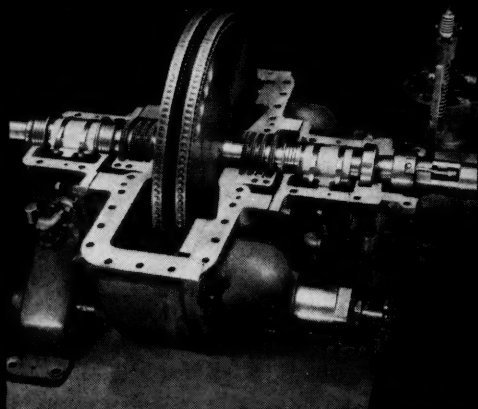
...and strategically-placed nozzles spray water over the blaze.
It's the fastest fire protection system ever devised!

If you work with solid propellants — or *any* material that demands ultra-high-speed fire control — Grinnell's new Primac system can give you the protection you need. Each Primac system specifically designed to fit a particular application. Write for information, to Grinnell Company, Inc., Providence 1, R. I.

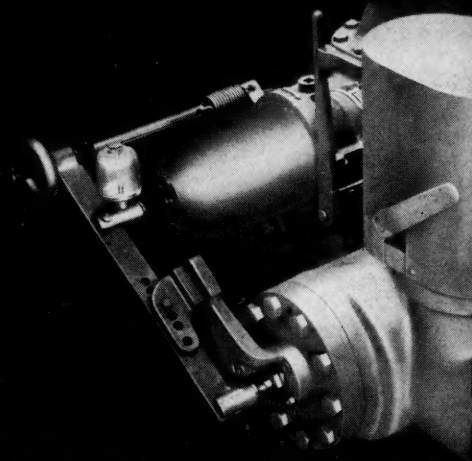
GRINNELL



AUTOMATIC SPRINKLER FIRE PROTECTION SINCE 1878



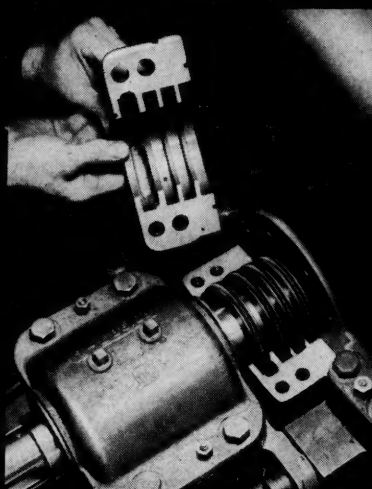
Precise alignment of shaft, through true centerline support, permits smooth and dependable operation at all operating temperatures.



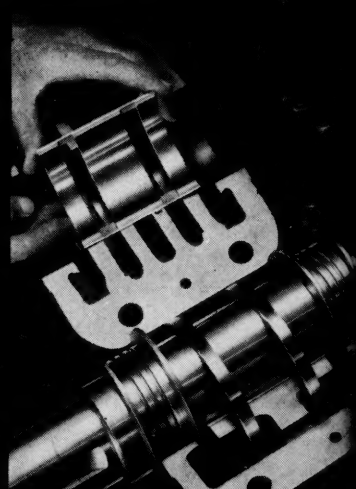
Simple, positive direct-acting speed-governing system is dependable, weather-proof, accurate. Separate trip gives positive overspeed protection.

These features mean dependable, economical turbine operation:

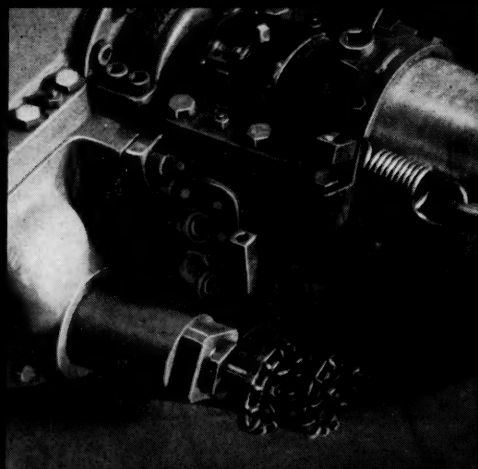
1. True centerline support
2. Positive speed control
3. Accessible shaft seals
4. Inexpensive bearings
5. Optional hand valve
6. Full protection



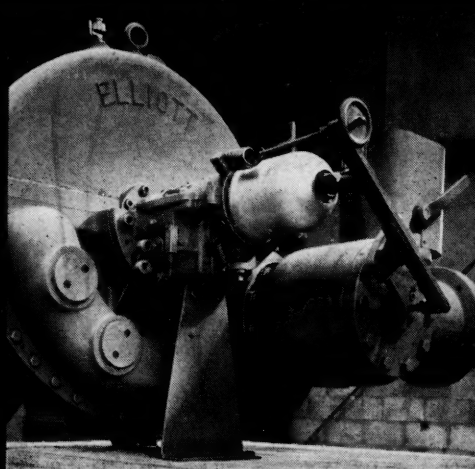
Accessible shaft-seals simplify maintenance and routine inspection. Covers readily removed without disturbing casing.



Inexpensive liner-type bearings readily installed with no scraping, fitting or adjustment required.



Steam-saving hand valve with pilot, which can be opened against full steam pressure, reduces steam consumption at partial loads.



All-weather protection is standard for Elliott YR turbines. They shrug off heat, snow, moisture, dust or contaminated atmosphere.

W
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**FROM TURBINE
HEADQUARTERS**



Six marked differences make Elliott turbines a better buy

Why are Elliott YR turbines your best choice for mechanical drives? Some of the reasons are described on the opposite page. These are tangible reasons why you can expect dependable, economical operation with little care or attention.

With more than 50 years' experience in mechanical-drive turbines up to 50,000 hp; with the most complete line of field-proven machines; with engineering and service facilities nationwide: Elliott is clearly "Turbine Headquarters." Write for bulletin H22-D.



H1-1

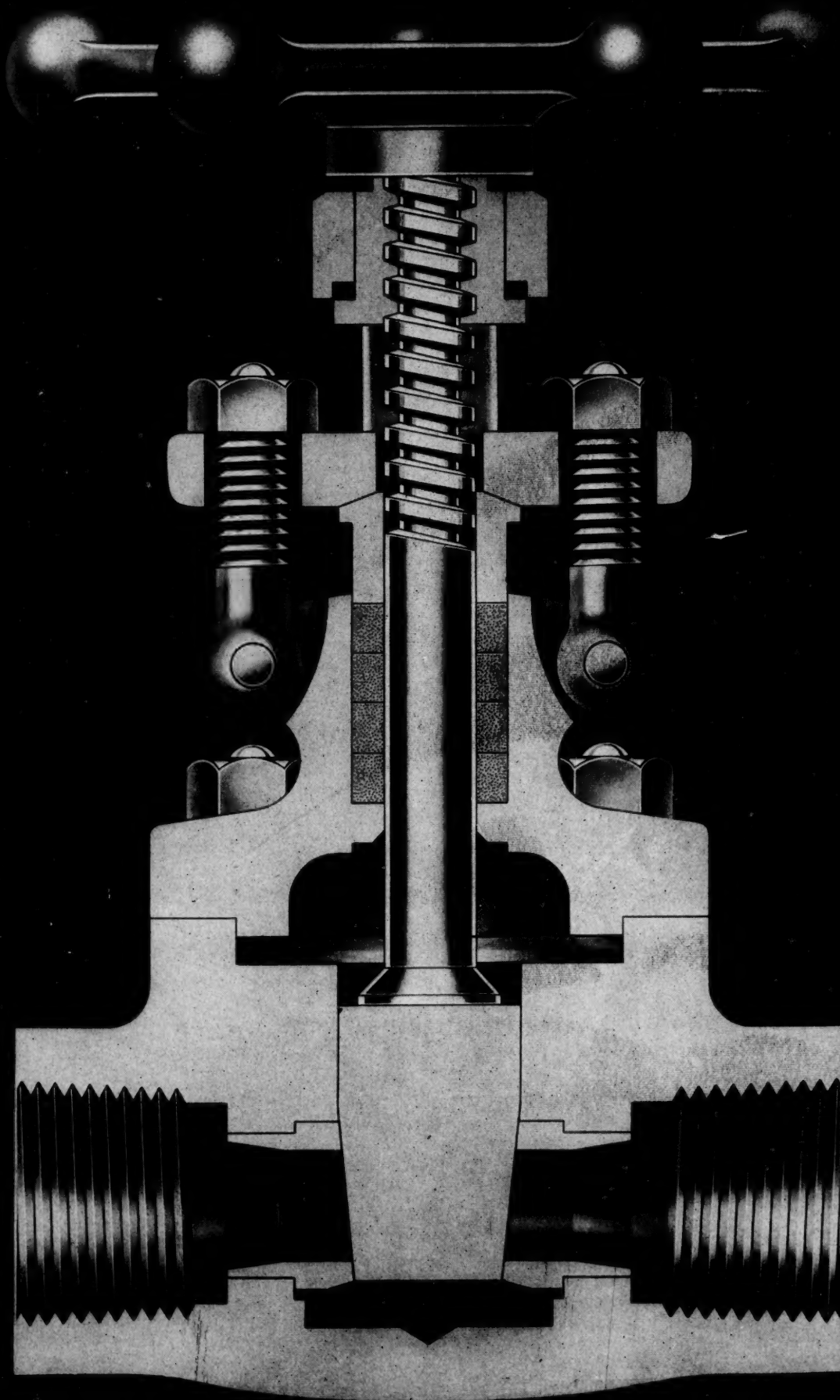
ELLIOTT COMPANY

GENERAL OFFICES: JEANNETTE, PENNSYLVANIA

PLANTS AT: Jeannette and Ridgway, Pa.; Springfield, Ohio

**TURBINES • GENERATORS • MOTORS • COMPRESSORS
TURBOCHARGERS • EJECTORS • STRAINERS • TUBE CLEANERS**

7
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The reputation of a valve is made by the plants it keeps on stream

A valve is often looked upon as a "supply item" until it prevents a major process shutdown and profit loss...

Hancock Steel Valves provide the dependable protection demanded for every process application today and tomorrow. They are available in a wide range of operational pressures and temperatures... in an extensive selection of alternate trim, body, and bonnet materials to match the toughest services. They have that extra measure of quality that only a leader knows how to build into a valve... extra quality that extends the operating period between turnarounds and assures efficient, economical processing of petroleum and chemical products.

The valve illustrated at the left is the Hancock Type 950 Steel Gate Valve widely used by the processing and power industries.

For technical assistance in selecting quality Hancock Steel Valves, phone your industrial supply distributor or write for Catalog 200A.



HANCOCK Steel Valves

A product of

MANNING, MAXWELL & MOORE, INC.

Valve Division, Watertown, Massachusetts

*Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario
Latin America: Export Division, Chrysler Building, New York, N. Y.
Europe: Manning, Maxwell & Moore, S.A., Fribourg, Switzerland*

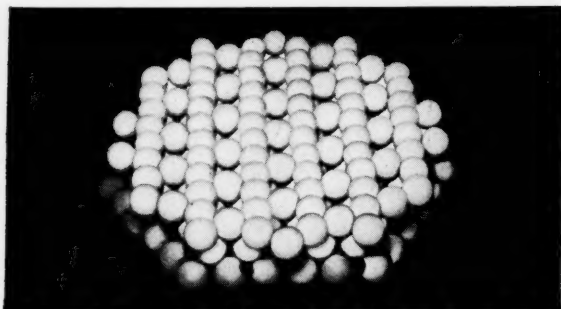
NEWS BRIEFS

ON THE CREATIVE USE OF

Minerals & Chemicals Philipp Corporation through its Industrial Division starts with four crystalline structures from the earth's crust: Kaolin, attapulgite, bauxite, and limestone, and ends with a variety of products serving many industries.

Through continuous basic research and precise processing, new and prime mineral and chemical products are developed by MCP from these crystalline structures. Through application research and pilot plant testing, MCP products are constantly being improved and applied to new uses in more and more fields, as indicated below.

If the following product applications suggest a use for MCP products in *your* field, we will be glad to discuss it with you . . . our research center at Menlo Park, N. J. is at your service. Save time — use the coupon.



Kaolin Products

Processed to remove moisture, sand, mica, and water soluble salts.

Properties: Flat crystals that form a smooth, glossy surface; high brightness; low abrasiveness; chemical compatibility.

ASP's® (Aluminum Silicate Pigments)

Adhesive additives that increase mileage
Paint extender pigments that cut costs, boost quality
Plastic fillers that improve properties
Printing ink extenders that give the right body for clean, sharp impressions
Rubber additives that lower compounding costs

CATALYSTS—Petroleum Cracking

Kaospheres — spherical pellets
Pelleted kaolin

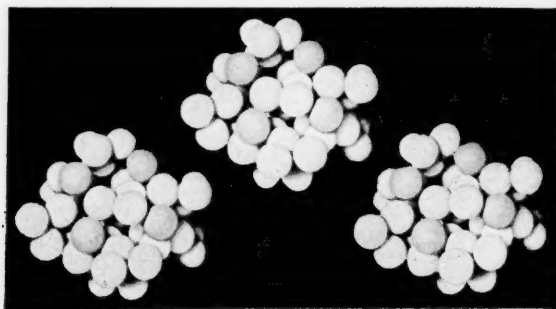
EDGAR® PAPER CLAYS

PAPER COATING CLAYS

SPRAY SATIN, predispersed, spray dried and slurry
STELLAR, nondispersed, lump and pulverized
HT', predispersed, spray dried and slurry
HT', nondispersed, lump and pulverized
S-22, predispersed, spray dried and slurry

PAPER FILLING CLAYS

KLONDYKE, water washed, unfractionated, lump, pulverized, predispersed and slurry
NOKARB, water washed, fractionated, lump and pulverized



Lime and Limestone Products

Selected, quality-controlled materials from the finest limestone strata known, graded for many varied uses.

Grades: *Agricultural* ground stone; spray and agricultural hydrate; all-purpose hydrate. Guaranteed analysis, meets strictest specifications.

Chemical limes for the manufacture of various chemicals; calcite flour as dust diluent and coagulant.

Construction primary and secondary road stone for sub-base materials; sized aggregates for pavements and ready-mix concrete; mason's hydrated lime; screenings.

Metallurgical limestone for blast furnace, open hearth, and electrical furnace; fluxstone; fluxing lime; foundry stone; cement stone.

Paper quick (CaO) and hydrated limes for Kraft liquor, calcium hypochlorite bleach, and water treatment.

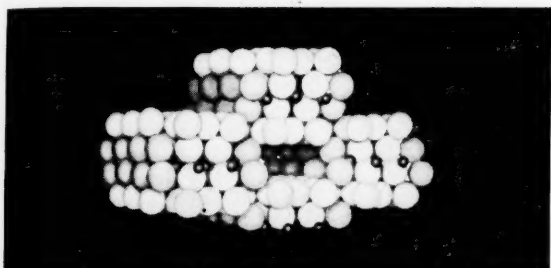
Other grades such as general-purpose hydrate, glasshouse stone, mine industry stone, sinter stone, screenings for water fills.

Minerals & Chemicals Philipp

9149 Essex Turnpike, Menlo Park, New Jersey

EXPORT DEPT.: Room 150, Garden State Parkway, Menlo Park, N. J. (Cable Address: "MICOR")

MCP PROCESS MATERIALS



Attapulgite Products

Naturally absorbent, thermally activated crystals in fine powder or coarse granulated form.

Properties: Narrow, needle-shaped crystals that are inorganic, chemically inert, adsorb both acid or alkaline products, and are highly sorptive to liquids. Special grades have ability to thicken or gel liquids without chemical change.

Products: *Petroleum* purifiers, desulfurizers, decolorizers, for refining and clarifying.

Foundry sand binder and thickener for better detailed, lower cost molding of non-ferrous castings.

Chemical conditioners for anti-caking, thickening, and suspending.

Agricultural carriers, diluents, and conditioners for dusts, wettable powders, insecticides, herbicides.

Adhesive agents for viscosity and body control.

Drilling Mud additives for higher yield.

Paint agents for thickening, stabilizing, suspending.

Paper coating and filling pigment for increased ink receptivity.

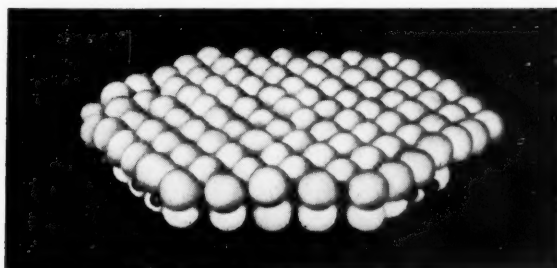
Pharmaceutical additives for toxin adsorption.

Liquid Fertilizer agents for stabilizing and enriching.

Industrial and Automotive absorbents for floor and process use.

Animal Litter products for deodorizing and sanitizing.

Additives, Agents, Carriers, and other product uses for improving quality, production, and performance, and for lowering product cost.



Bauxite Products

Thermally treated, high alumina content products in the form of irregularly fragmented particles of controlled mesh sizes.

Properties: Hard, durable, thermally resistant, adsorbent or catalytic, and of high surface area.

Products: *Petroleum* refining adsorbent for removing color, odor, and taste.

Chemical catalyst and catalyst carrier for petrochemical and other processes.

Gas and Liquid dryers for commercial petroleum and petrochemical applications.

Other applications such as alkylation, desulfurization, dehydration, defluorination, percolation, etc.

MINERALS & CHEMICALS PHILIPP CORP.

9149 Essex Turnpike, Menlo Park, N. J.

I. I am interested in the following MCP products (show contemplated use):

ASP's ☐ PAPER CLAYS ☐ ATTAPULGITE ☐ BAUXITE ☐
LIME & LIMESTONE ☐

2. Our application or interest is _____

3. Please send without obligation:

☐ data ☐ samples ☐ prices ☐ technical representative

Name _____

Title _____

Company _____

Address _____

City _____ Zone _____ State _____

Use this quick two-check coupon . . .

- ☒ for your product interest
 - ☒ for what you need to get tests started
- we'll fill your requests immediately

For more data, see your 1961 Chemical Materials Catalogue, pages 423-430

CORPORATION



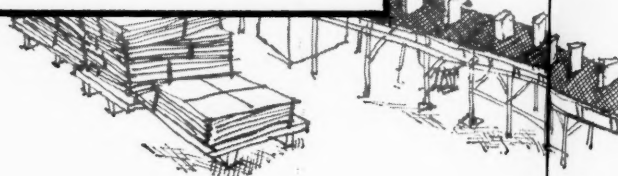


AT THE HEART OF INDUSTRY...

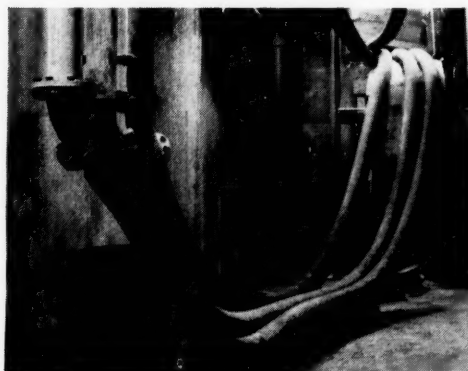


"We turn out 3,000,000 feet of board a day," reports the chief engineer of Masonite Corp., Laurel, Miss., "and our entire volume of wood chip required to fabricate the board is carried on US Oilproof Paracril® Conveyor Belts that operate 24 hours a day, 7 days a week over deep-trough idlers. This belt system has reduced downtime considerably, cut maintenance costs 25%."

CB 117

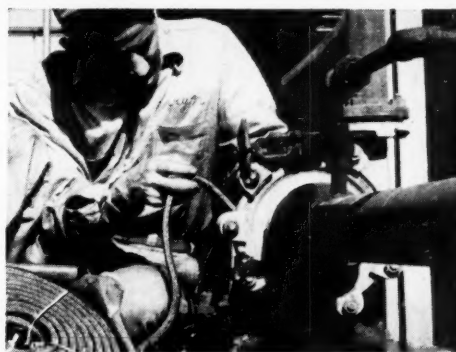


Processing industries of every kind find in US the superior industrial rubber product quality that keeps materials flowing—freely, efficiently, steadily. US is at the heart of industry because US knows industry and its needs...and serves those needs better.



Softening water on a chemical diet, U.S. Giant® Acid Hose is unharmed by hot lime, ferric sulphate, alum solution, and soda ash at Kansas City Water Works' chemical treatment plant. An economical way of conveying softening chemicals to the water supply, U.S. Giant is used for suction and discharge, is extremely flexible, resists abrasion, impact, and weather.

H 114



"Outlasted any other packing tested as much as 10 to 1," reported a large chemical plant about U.S. Solvent Packing, Style 414. Used on its caustic and solvent pumps, this US packing ended clean-up chores, increased production, reduced injuries due to leaks by 75%. Look beneath the surface and you'll find U.S. Rod and Sheet Packings sealing better, lasting longer, saving money throughout industry.

P 101



More than 6 times the life of other Variable Speed Belts, reports the Storm Lake, Iowa, plant of Hygrade Food. The first US Variable Speed Belt installed has already outperformed the previous belts by more than 6 to 1. What's more, it required no dressing or other maintenance and, unlike previous belts, has not developed uneven edge wear which shortens equipment life.

VSB 101

For every industrial rubber product need, turn to **US**. For Conveyor Belts, V-Belts, the original PowerGrip "Timing"® Belt, Flexible Couplings, Mountings, Fenders, Hose and Packings... custom-designed rubber products of every de-

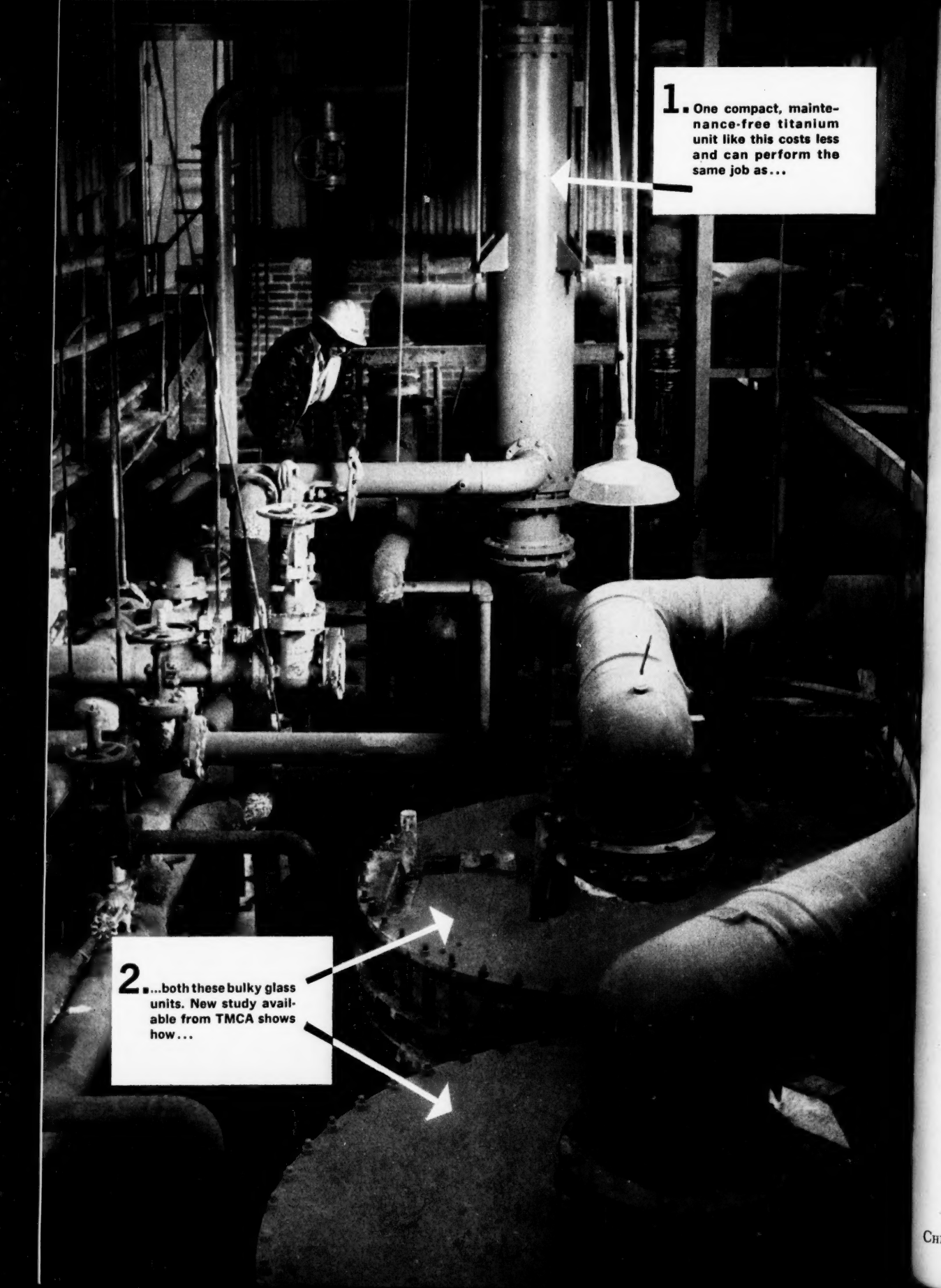
scription. Discover why U.S. Rubber has become the largest developer and producer of industrial rubber products in the world. See your U.S. Rubber Distributor or contact **US** directly at Rockefeller Center, New York 20, N. Y.

WORLD'S LARGEST MANUFACTURER
OF INDUSTRIAL RUBBER PRODUCTS



United States Rubber

MECHANICAL GOODS DIVISION



1 ■ One compact, maintenance-free titanium unit like this costs less and can perform the same job as...

2 ■ ...both these bulky glass units. New study available from TMCA shows how...

In wet chlorine...

Lifetime **Titanium** heat exchangers return 30% on investment, pay for themselves in 2.5 years

According to a new economic study now available through Titanium Metals Corporation of America, titanium heat exchangers for cooling chlorine cell gas can return 30% after taxes on their investment, and pay for themselves in two years and a half, when depreciation is considered.

At the same time they reduce maintenance, increase operating efficiency, save space or allow the use of what is normally wasted space, and eliminate possible product contamination through tube failure.

In existing plants already using contact coolers, the substitution of titanium heat exchangers for steam stripping returns comparable amounts...23% and more on the added investment and a pay-back in three years or less.

These startling returns are gained primarily through reduced operating costs. As the study reveals, a plant producing an average 100 tons a day can save more than \$20,000 a year through the use of titanium coolers.

Glass tube coolers, on the other hand, fare less well. In comparison with titanium used in indirect cooling, their initial cost is higher; the return on investment is lower (8.8%); the pay-out time much longer (5.3 years).

WHY TITANIUM?

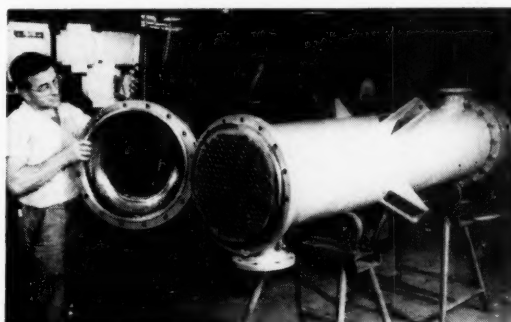
High performance. Among the reasons for titanium's success in this important application are its absolute immunity to wet chlorine corrosion...its lightness and strength, even at high temperatures...its ease of fabrication...and its heat transfer properties, which are significantly better than glass.

Titanium unit costs lowering. TMCA composite price index has dropped from \$15.25 in 1954 to \$6.97 per pound by early 1961. As fabricators have come to realize that titanium is as easy to fabricate as most steel alloys, these costs have dropped too.

The present study is based on the current price of titanium heat exchangers, which now range from \$25 to \$30 per square foot, a considerable reduction over the recent past.

Stauffer unit saves space, more efficient. Stauffer Chemical Company, Niagara Falls, N. Y., has a titanium heat exchanger in chlorine cell gas cooling. The titanium unit requires far less space than either of two glass units and yet can carry the same load as the glass units combined. The titanium heat exchanger is installed in relatively inaccessible, formerly "waste" space, since the unit requires no maintenance. Glass coolers require three to four downtimes a year. Stauffer also reports that the titanium cooler operates at greater efficiency and reduces the amount of sulfuric acid needed in final cooling.

How TMCA can help you cut chlorine cell costs. First, write for the study, "New Economies in Cooling Chlorine." If titanium units appear to be able to help you in your battle against cost—and it is highly likely that they can—talk to Titanium Metals Corporation of America. TMCA's Technical Service Department can put you in touch with competent fabricators and supply the technical data needed to help you trim your costs and boost your process efficiency in wet chlorine...inhibited sulfuric acid...hypochlorites...acetic acid...nitric acid...and other corrosive applications. Write today!



Heat exchanger containing 268 titanium tubes, is used in Stauffer Chemical Company's Niagara Falls, N. Y., plant to cool chlorine gas from 75°C to 40°C. The titanium unit, providing 394 square feet of heat exchange surface area went into operation in 1959, shows no sign of corrosion and needs no maintenance.

This important study is available to you at no cost.

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ENGINEERS AND CONSTRUCTORS FOR INDUSTRY

Saline Water Conversion Moves a Major Step Closer to Large-Scale Operation

Department of The Interior Selects Lummus to Evaluate Freezing Processes and Design Demonstration Plant

The Lummus Company has been selected as the architect-engineer for the East Coast saline water conversion plant which is to be erected at Wrightsville Beach, North Carolina, Secretary of the Interior Stewart L. Udall announced recently. The Wrightsville plant is the fifth in a series of five plants authorized in 1958 by Congress to demonstrate the engineering, reliability, and economic potentials of the most promising conversion processes in existence today.

The contract awarded to Lummus calls for an evaluation of the *freezing* processes of saline water conversion. (Of the other plants in the series, three will use various distillation processes and one an electrodialysis process.)

The initial activity of Lummus' contract will require preliminary engineering service to prepare estimated plant costs, layouts, and reports. A second phase will include the design of the plant to permit issuance of specifications for the construction of the demonstration

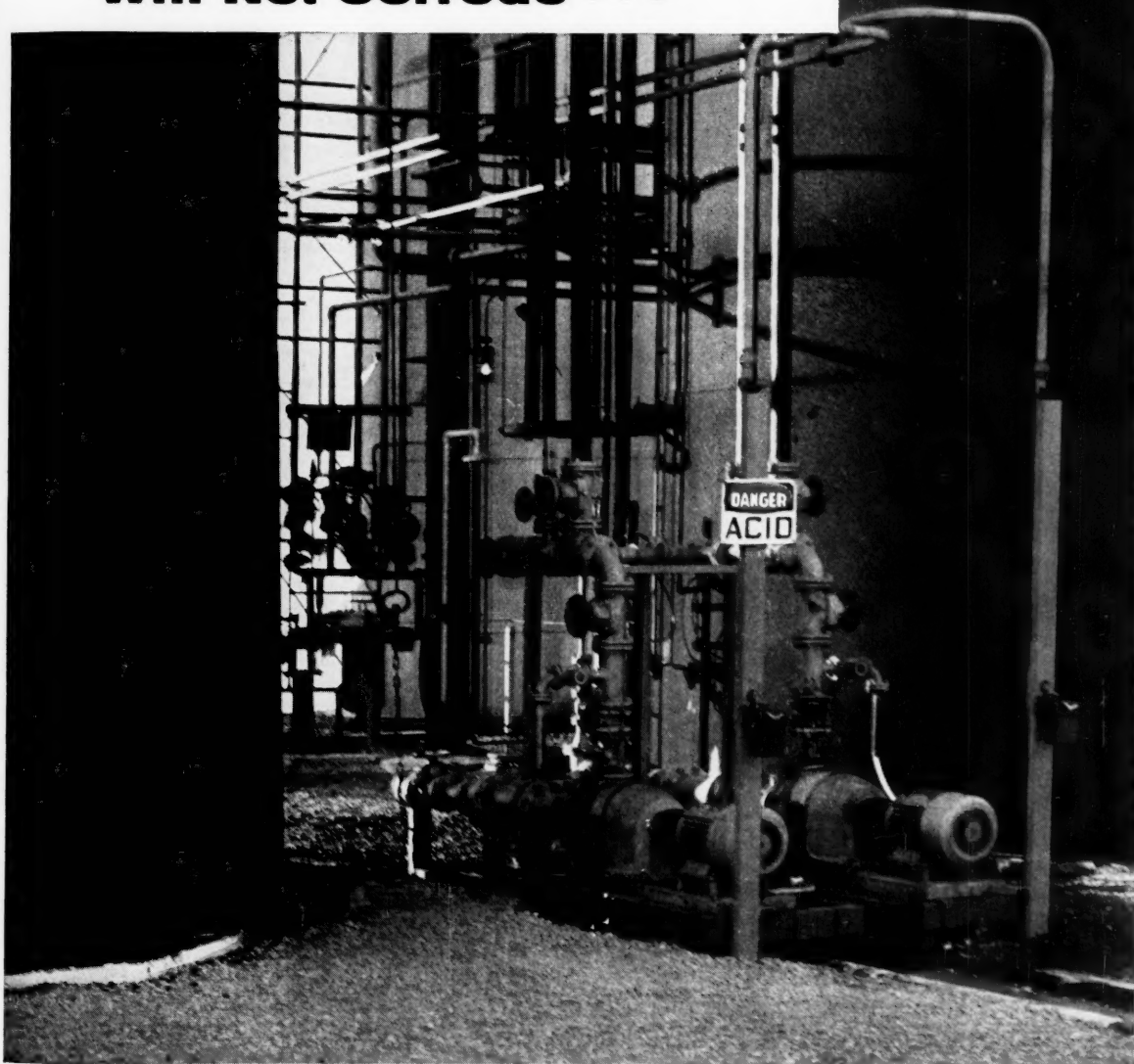
plant as well as consultation with the Office of Saline Water on matters relative to awarding a construction contract for the plant.

Lummus was chosen from a group of 35 engineering firms considered for the assignment on the basis of its experience in such parallel fields of technology as refrigeration, heat transfer and crystallization. "Product" from the plant will be water of a quality suitable for municipal, industrial or other beneficial consumption. Production rate will be 250,000 gallons per day.

Over 900 plants have been designed, engineered and constructed by Lummus for the process industry throughout the world in the last fifty years. Why not discuss your next project with a Lummus representative?

THE LUMMUS COMPANY, 385 Madison Avenue, New York 17, New York, Newark, Houston, Washington, D. C., Montreal, London, Paris, The Hague, Madrid; Engineering Development Center: Newark, New Jersey.

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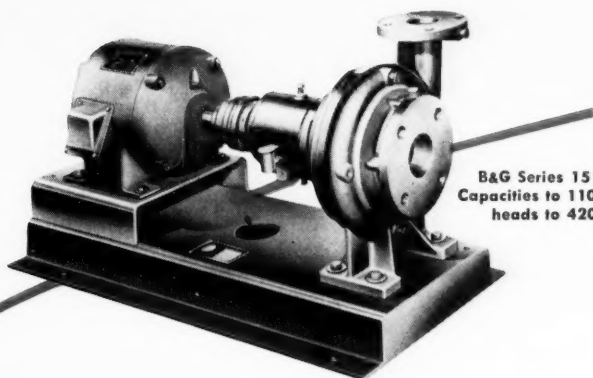
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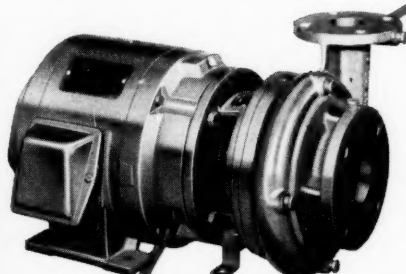
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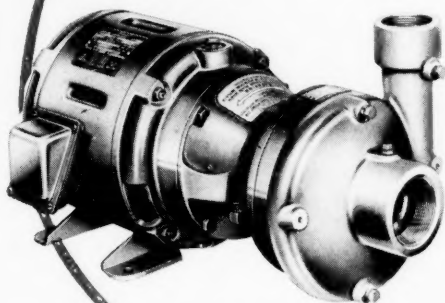
B&G Series 1510-B.
Capacities to 1100 GPM,
heads to 420 ft.

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...an exclusive feature for leakproof operation



B&G Series 1531-B. Capacities
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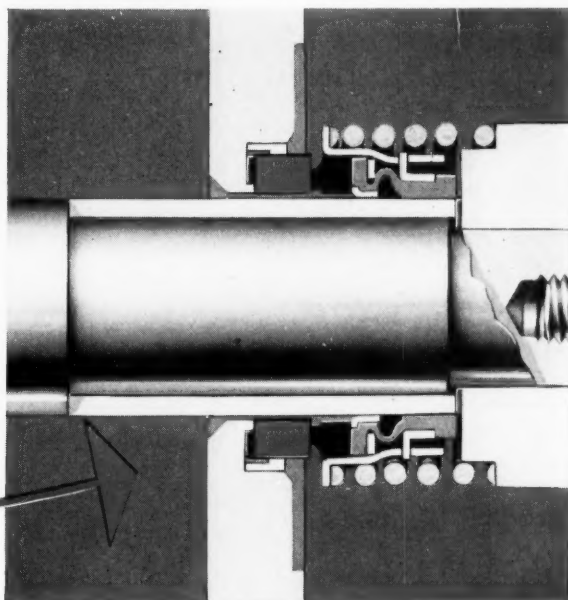


B&G Series 1522. Capacities
to 150 GPM, heads to 115 ft.

Take just a moment to examine the design features of B&G Centrifugal Pumps. You'll find plenty of reasons why these pumps are giving trouble-proof performance through long years of service.

Vertical split-case construction permits removal of the bearing bracket without disconnecting pipe lines or motor leads. Solid cast iron volutes, with support feet in larger units, effectively prevent piping strain on the motor.

The shafts of B&G Centrifugal Pumps are an outstanding feature. Made of special alloy steel, they are super-finished and oversized to keep deflection at a minimum. The "Remite" Mechanical Seal—a B&G development—positively prevents leakage...and impellers are soundly designed to maintain hydraulic balance. An oil lubrication system, instead of grease cups, assures continuous protection to the long bronze bearings.



Exclusive "Remite" Mechanical Seal

This B&G feature eliminates the customary leakage which occurs where a packing gland is used. A Carbon Seal Ring faces on a "Remite" floating seat—a new type of material, so hard it will scratch glass—wear-proof and corrosion-resistant. Metal parts are of steel, bronze or stainless steel, depending upon the type of service. The B&G Mechanical Seal is self-lubricating.

Materials of construction

B&G Centrifugal Pumps are available as all-iron, bronze-fitted and all-bronze units. Series 1522 Pumps are also available in stainless steel.

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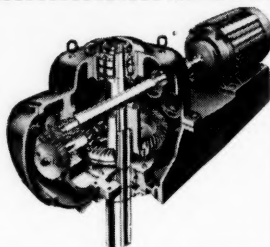
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Good General Rule: In promoting heat transfer, determine the flow pattern that will give the best transfer conditions—then get the mixer that provides it.

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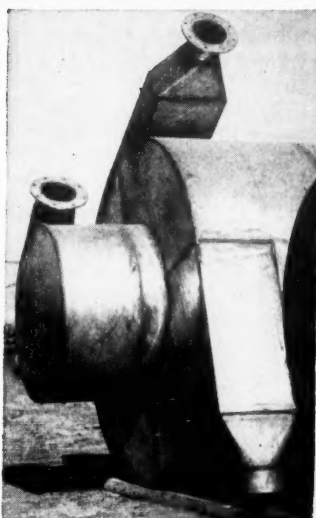
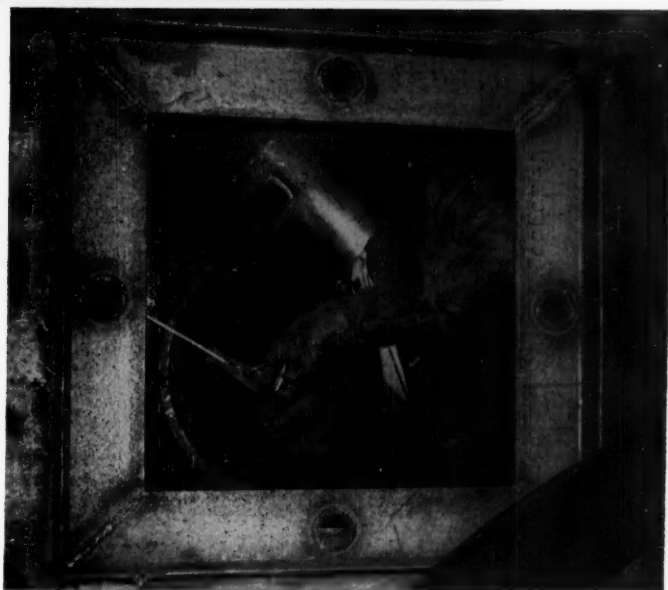
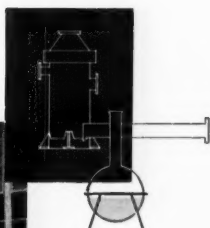
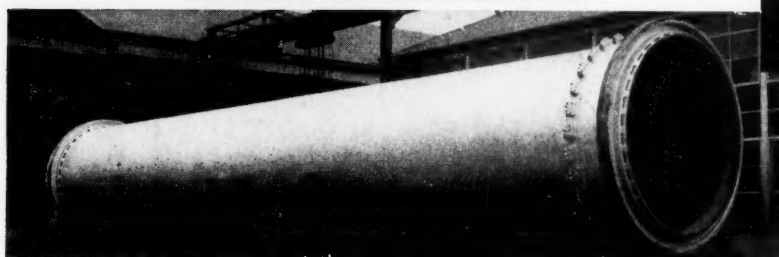
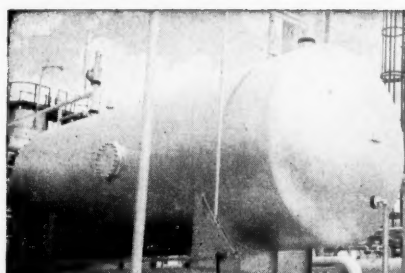
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MEMBER



Top: one of a series of A. S. M. E. code stainless steel feed and flash tanks for United Gas Pipeline Company. Center: an 8' OD x 60' dryer, composed of one-third solid type 316 stainless steel, two-thirds type 316 20% clad, with interior end cone of Hastelloy C. Bottom: Stainless steel cyclones produced for the Fish Engineering Company.

See the Boardman catalog in the 1961 issue of the Chemical Engineering Catalog, pages 803-806.

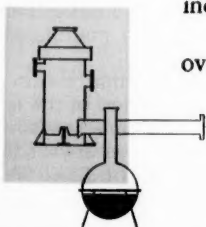
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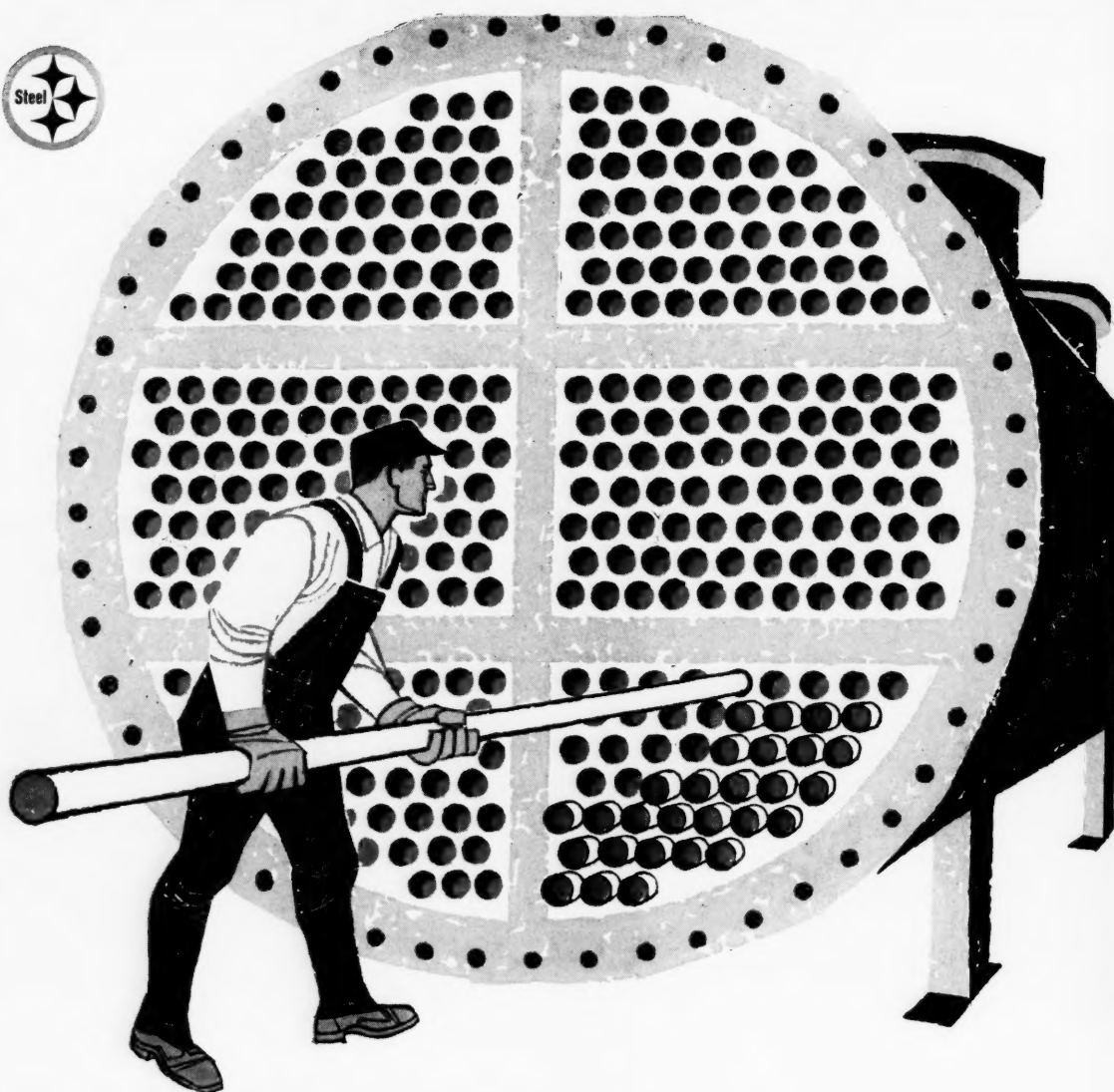
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CHEMICAL ENGINEERING—September 18, 1961



How to prevent corrosion when the pressure's on

Armco Steel Corp.
The Babcock & Wilcox Co., Tubular Products Div.
The Carpenter Steel Co., Alloy Tube Div.
Jones & Laughlin Steel Corp., Electricweld Tube Div.
National Tube Div., United States Steel Corp.
Ohio Seamless Tube Div., Copperweld Steel Co.
Republic Steel Corp., Steel and Tubes Div.
Revere Copper & Brass Inc., Rome Mfg. Co. Div.
Sawhill Tubular Products, Inc.
Southeastern Metals Co.
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You can get the assurance of stainless tubing and pipe that meets high domestic standards from the quality stainless producers listed at the left. It will pay you in precision as well as in cost cutting, corrosion-killing reassurance to get information about stainless steel welded tubing from any of them. Or you can write for your free Booklet 8591 to Department CE-6, Welded Steel Tube Institute, Inc., Hanna Building, Cleveland 15, Ohio.

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one-man fertilizer-mixing plant

Consumers Cooperative Association, Kansas City, Mo., operates a dozen bulk fertilizer plants in a nine-state area. Each plant mixes fertilizer—from a ton to a truck-load—to the customer's specifications while he waits. The entire process is operated by one man from the seat of a "PAYLOADER" tractor-shovel.

This fast, accurate and efficient cycle begins with the "PAYLOADER" and its precise, hydraulic bucket control with which the operator takes the separate ingredients from their bins and weighs each one into a 1-ton scale hopper. By means of air-control valves and push-buttons grouped within his reach, he dumps the hopper, elevates the batch to the mixer, starts the mixer and dumps the fertilizer through a chute into the waiting truck.

As soon as the scale hopper is emptied, he loads it with another batch so that the process is practically continuous, and up to 20 tons of fertilizer can be mixed and delivered per hour.

Your Hough Distributor has a "PAYLOADER" size — up to 12,000 lbs. operating capacity — to fit your job, plus the finest service and parts facilities in the business.

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9-A-1

THE QUESTION:

We are operating our present tower, packed with ceramic raschig rings to the full limit of its capacity. Liquid rate is 2500 lbs./sq. ft./hr., and the gas rate is 1000 lbs./sq. ft./hr. If we replace the 1" ceramic raschig rings with 1" Intalox saddles, what increase in capacity can we reasonably expect to obtain?



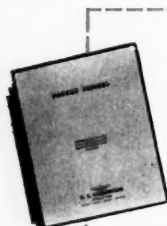
In these days of high equipment costs, wise management looks for ways to increase the output of existing equipment. Questions similar to this one are among the most frequently presented to U. S. Stoneware engineers.

THE ANSWER:

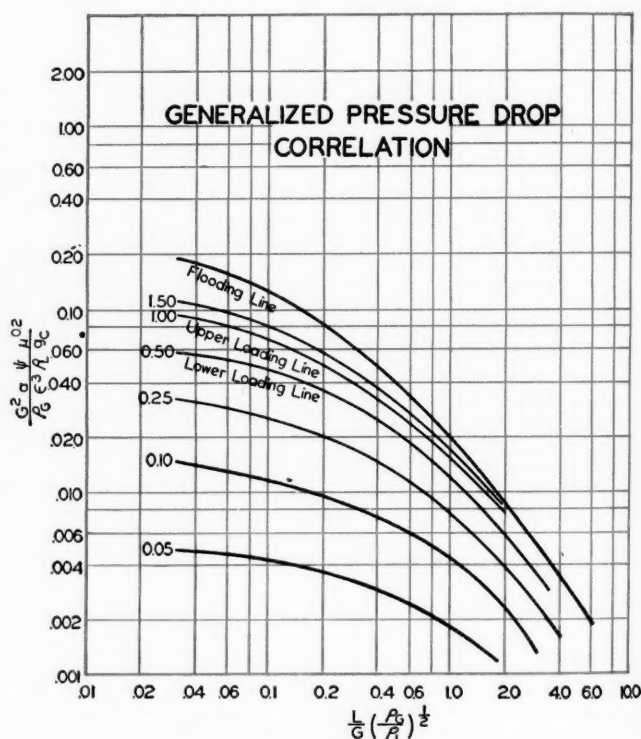
This question can be readily answered by the use of the packing factor chart (GR-122R-1) and the Generalized Pressure Drop Correlation (GR-109R-3) curves taken from U. S. Stoneware's Engineering Manual on Packed Towers.

Inspection of the variables on the ordinate of the Generalized Pressure Drop Correlation shows that the gas rate is inversely proportional to the square root of the packing factor. Reference to the packing factor chart shows that the packing factor, α/ϵ^3 for 1" raschig rings is 160 and for Intalox saddles is 98. Therefore, the increase in capacity which could be expected would be equal to $\left(\frac{160}{98}\right)^{1/2}$ or 28%.

46-H



The data appearing in U. S. Stoneware's ENGINEERING MANUAL ON PACKED TOWERS offers ready answers to this and countless other questions on packed tower performance. If you would like a copy for your personal or company use, please write us on your letterhead.



L = LIQUID RATE, LBS./SEC., SQ. FT.
 G = GAS RATE, LBS./SEC., SQ. FT.
 ρ_L = LIQUID DENSITY, LBS./CU. FT.
 ρ_G = GAS DENSITY, LBS./CU. FT.
 ϕ_c = PACKING FACTOR $\approx F_p$
 μ = VISCOSITY OF LIQUID, CENTIPOISE
 ψ = RATIO, DENSITY OF WATER / DENSITY OF LIQUID
 ϕ_c = GRAVITATIONAL CONVERSION FACTOR = 32.2

Process Equipment Division

U. S. STONWARE
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Chementator

New flotation technique may be key to unlocking many low-grade ores

Froth flotation of ion exchange resins may make possible the recovery of metals from heretofore uneconomic ores. This is the conclusion of researchers at the New Mexico Institute of Mining & Technology, Socorro, N. M.

According to the Institute's R. B. Bhappu, laboratory tests have shown that cation exchange resins can be floated with cation amine-type collectors, while anion resins can be floated with the anionic sulfonate and thiosulfate types.

These results could have major significance in treating low-grade ores of such metals as copper, uranium, gold, nickel and zinc that are susceptible to leaching. Unlike resin-in-pulp and continuous countercurrent ion exchange processes now used for uranium, the new flotation technique can be used on high-solids unclarified ore pulps.

Resin flotation could be easily worked into a continuous flowsheet in which the ore would be leached and contacted with resin. The loaded resin would be separated by flotation, then eluted and returned to the process.

Pneumatic flotation cells are best for the method; resin particle size can vary from 16-mesh down to 400-mesh. Amount of collector needed for flotation: from 0.015 lb. to 0.1 lb. per ton of resin, depending on amount of slimes.

Texas plant gets new clathration process for making pure *m*-xylene

Another route to the difficult separation of *m*-xylene from *p*-xylene is getting a commercial tryout in a new unit that just came on stream at Cosden Petroleum Corp.'s Big Spring, Tex., refinery.

Licensed by Union Oil Co., Los Angeles, the process yields *m*-xylene by a clathration step rather than by the conventional freezing-crystallization method.

Cosden reportedly achieves separation of the two xylenes by adding an inorganic compound that forms a clathrate with the *m*-xylene. (Essentially, *m*-xylene molecules are selectively trapped out of the mixture and held by the inorganic compound.) When the solid clathrate is filtered out and further processed (e.g., by heating), the liquid *m*-xylene is released from the clathrate.

Capacity of the new plant is said to be in the range of 5 million lb./yr. *m*-xylene, which is used principally as feedstock for making isophthalic acid. A byproduct stream, rich in *p*-xylene, could conceivably be used as feed to a *p*-xylene unit that Cosden operates at the same location for Phillips Petroleum.

Industry observers say that this new *m*-xylene source could be a precursor to new entries in the isophthalic business. The only two current isophthalic producers, Oronite and Amoco, already have captive supplies of *m*-xylene.

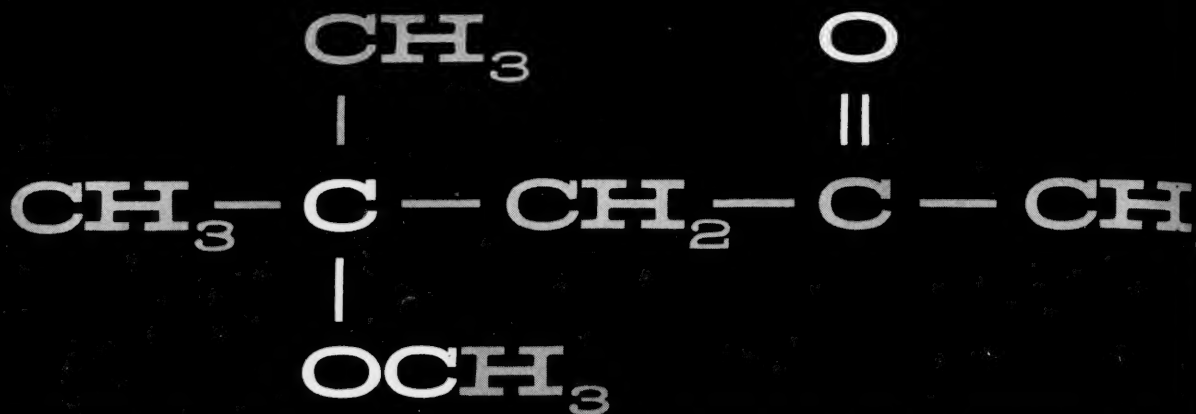
The clathration process was originally envisioned by Union Oil as a *p*-xylene producer, but has been developed by Cosden to the point where either the *meta* or *para* isomer can be pulled out of a mixed stream by varying the operating conditions.

Two more firms add to stepped-up ethylene-propylene rubber activity

Enjay Chemical Co. has made its expected move into ethylene-propylene rubber (EPR). Exhibiting samples at the National Chemical Exposition in Chicago earlier this month, the company has started marketing EPR in development quantities. Unofficial reports say that, for the present, the product is being made in a converted butyl line at Baton Rouge.

Enjay's entry brings to four the number of U.S. companies test-marketing EPR.

Du Pont and Hercules had previously announced their interest. And now AviSun tells *CE* it has been test-marketing the elastomer for



Unique keto-ether structure of Shell Chemical's new Pent-Oxone high boiling solvent. COC of ethers and double bond O of ketones unite in this single Pent-Oxone solvent molecule to give you double solvent action.

VINYL SOLVENT:

Vinyl lacquers made with Shell

Chemical's new Pent-Oxone* high boiling solvent
cost less and smell better

Pent-Oxone solvent costs 17.5¢ per pound delivered in tank cars. It is mildly camphor-like in odor. It is a good solvent for vinyl resins and displays a high tolerance for hydrocarbon diluents.

Read how this remarkable Shell Chemical keto-ether compares with other high boiling vinyl solvents in evaporation and solution viscosity. And where to send for newly issued Pent-Oxone solvent technical bulletins.

PENT-OXONE is the only commercially available solvent which gives you both ketone and ether functional groups in a single molecule.

It is a true high boiler with an even evaporation rate midway between the evaporation rates of EGME acetate and cyclohexanone.

Low cost, high dilution, excellent solvent

Three qualities of this unique Shell solvent contribute to its lowering your costs on vinyl lacquers:

First, Pent-Oxone solvent has a comparatively low cost of 17.5¢ per pound, or \$1.325 per gallon, delivered in tank cars.

Second, Pent-Oxone can tolerate any amount of aromatic diluent within the practical formulating range in vinyl chlo-

ride/vinyl acetate copolymer solutions.

Third, Pent-Oxone is an excellent high boiling solvent for vinyl resins.

In addition, Pent-Oxone solvent's mildly camphor-like odor is more agreeable than the odors of other high boiling vinyl resin solvents.

High boiler comparison

As you might expect, Pent-Oxone's remarkable keto-ether structure gives it excellent solvent properties.

Here are viscosity comparisons with cyclohexanone on three week-old Vinylite** resin solutions:

15%	Pent-Oxone/MEK	43 cps.
VYHH	cyclohexanone/MEK	44 cps.
15%	Pent-Oxone/MEK	44 cps.
VMCH	cyclohexanone/MEK	46 cps.
15%	Pent-Oxone/MEK	62 cps.
VAGH	cyclohexanone/MEK	55 cps.

Both solvents were mixed 50/50 with Shell's MEK to reflect more accurately finished formulations, then diluted 50/50 with toluene.

New technical bulletins

New technical bulletins are now available from Shell on a variety of Pent-Oxone solvent applications.

One deals with Pent-Oxone solvent vinyl lacquers. Another deals with Pent-Oxone and its twin, Pent-Oxol* glycol ether, in acrylic formulations. A third gives property data on both these solvents.

For copies of these bulletins, plus samples, contact any of Shell's nine Industrial Chemicals Division offices, or write Shell Chemical directly at 110 West 51 Street, New York 20, New York.

*Trade mark, Shell Chemical Company
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Chemical
Company**



Industrial Chemicals Division

a year and a half. Like the others, AviSun expects large volume, general-purpose—rather than specialty—markets for EPR (*Chementator*, July 24, p. 59).

Enjay's affiliate, Esso Research & Engineering, made more EPR news in Chicago this month with a paper presented before the American Chemical Society on improved vulcanizing agents for the hard-to-cure elastomer.

Because they contain no chemical functionality, saturated polymers such as EPR cannot be cross-linked with conventional rubber-vulcanizing agents. The only previously successful method known for vulcanizing these products has been by using sulfur and organic peroxides, such as dicumyl peroxide.

Now, Esso has unearthed three agents—trichloromethane sulfonyl chloride, trichloromelamine and quinone-N-chlorimide—that eliminate the peroxides' major drawbacks: deficient hot-tear strength, objectionable odor, high cost. Esso reports hot-tear strengths approaching 300 lb./in., comparable to the best encountered in other rubbers, and superior to tear strengths achieved by sulfur-peroxide cures.

If produced in volume, any one of the three new agents could be priced considerably lower than organic peroxides; one industry guess is \$0.50-1/lb., compared with \$1.50-4/lb. Products would be used in about the same proportions as peroxides, 3-4 parts/100 parts of polymer.

Enjay Chemical Co. and textile-maker J. P. Stevens & Co. have acquired The National Plastic Products Co., a polypropylene filament producer. Commercial production of polypropylene fiber is probably not far off, since Enjay and Stevens have been working on a joint fiber research project for more than a year.

New phenol price puts squeeze on Northwest resin manufacturers

Recent price cuts in phenol—from 17¢/lb. to 16.25¢/lb.—may have further periled the market position of adhesive resin producers in the Pacific Northwest, who normally would welcome such a reduction. Reason: price cuts may swell the tide of plywood manufacturers that are making their own phenolic adhesives.

Georgia-Pacific and Simpson Timber Co. now make all their own phenolic resins. Weyerhaeuser and U.S. Plywood are among the other firms that are actively considering a switch to captive production.

Lower phenol prices bring the cost of making phenolics captively (7-8¢/lb.) close to the cost of using lower-quality casein and urea-formaldehyde resins. (Phenolics are the only adhesives that can be used for outdoor-grade plywood.)

Lower costs for phenolic resins may also hasten the advent of industry standardization on a single grade of high-quality, phenolic-bonded plywood. Major obstacles now blocking standardization are lack of a fast-curing phenolic (required for high production rates) and the need for some plants to install hot-setting presses to handle phenolics.

It's estimated that phenolic resins have captured 40% of the plywood adhesive market; some believe this may soon rise to 75%. When and if the industry adopts a single plywood grade, market for phenol in the Northwest could soar to 80-100 million lb./yr. Sensing this, Allied Chemical is considering a Northwest phenol plant, which would be in addition to the Dow, Monsanto, and California Chemical plants already on the West Coast.

Adding to the rapidly mounting capacity for petroleum-derived naphthalene, Texaco says that it intends to erect a 100-million-lb./yr. plant at its Port Arthur, Tex., refinery. The unit is scheduled to go on stream by 1963.

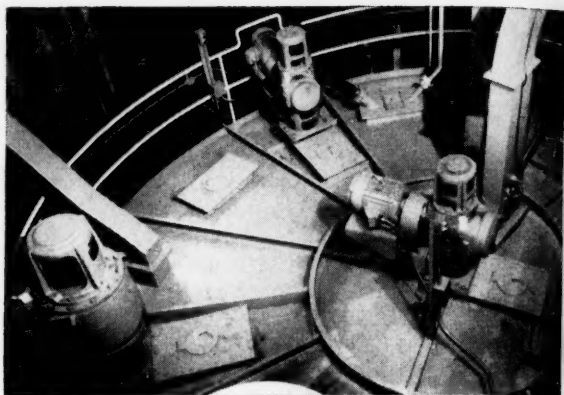
Program to conserve helium is off to a flying start

The Dept. of Interior's new helium conservation program—based on government purchase of crude helium extracted from natural gas by private firms—is moving into high gear.

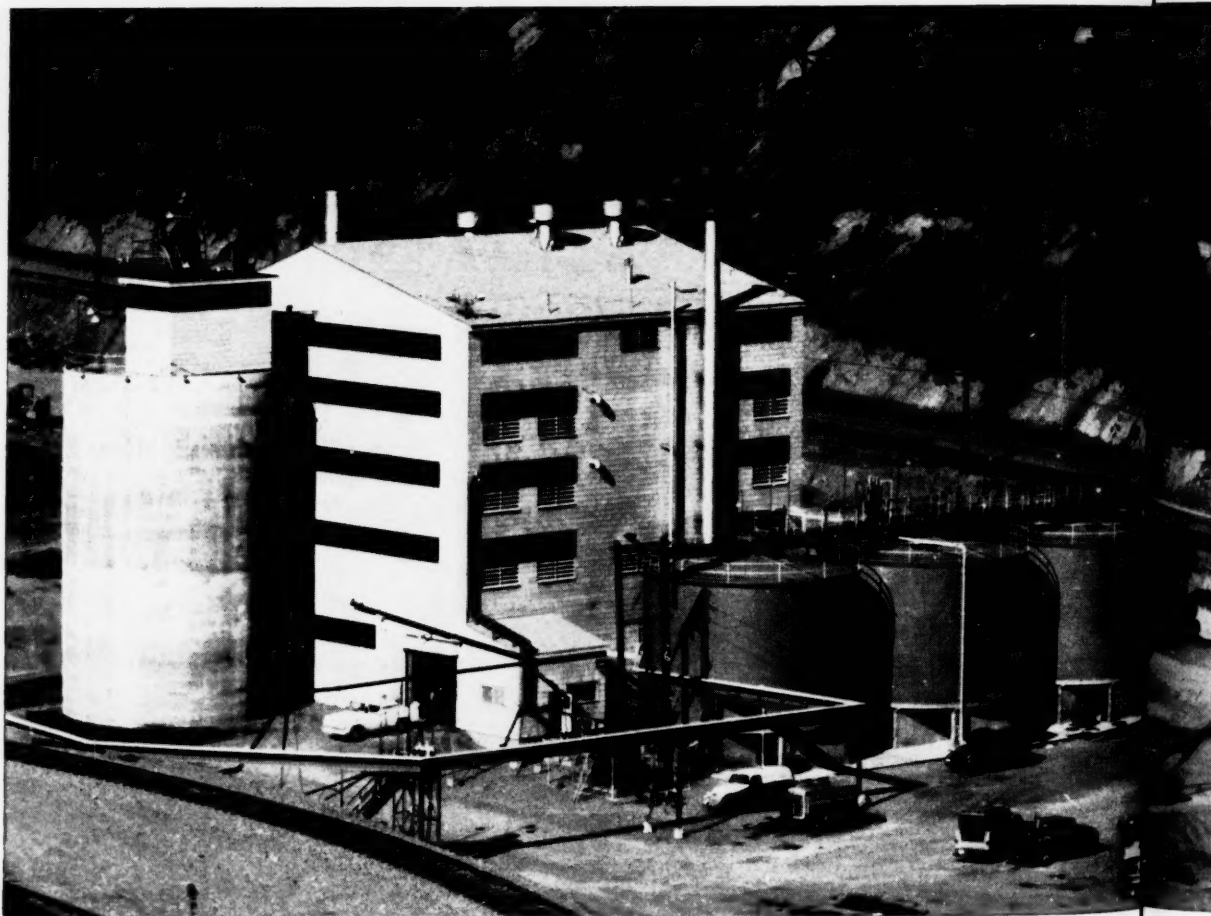
Two purchase contracts have already been signed and two others are in the final stages. Also, Interior has started the ball rolling for a big increase in the wholesale price of the pure helium it produces, to finance the over-all conservation program.

(Continued on page 64)

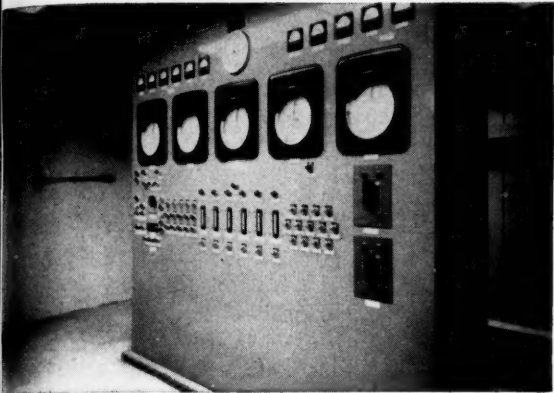
Top view of newly-developed Dorr-Oliver Single Tank Reactor used in this plant for the first time.



SO_2 from zinc plant opens way for p



Aerial view shows the complete Phosphoric Acid Plant of The Bunker Hill Company at Kellogg, Idaho. Three 35' Dorr Storage-Clarifiers are seen in the foreground.




The entire plant operation is controlled from this central instrument panel.

or phosphoric acid production at

THE BUNKER HILL COMPANY

Another example of Dorr-Oliver engineering



Operated in conjunction with the Company's important zinc reduction facilities nearby, the new Phosphoric Acid Plant of The Bunker Hill Company, Kellogg, Idaho, was constructed in 42 weeks, put into production in January this year, and very quickly achieved capacity and efficient operation. The plant has a design capacity of 130 tpd of 54% P_2O_5 product acid (70 tpd P_2O_5).

The Dorrco Strong Phosphoric Acid Process is used, utilizing Western phosphate rock and sulphuric acid manufactured from SO_2 gas from the zinc plant roasting operation. Complete engineering, plant design, purchasing of equipment and supervision of erection and initial operation were handled by the Dorr-Oliver organization.

Selection of Dorr-Oliver was based on over 40 years of experience in constructing wet process P_2O_5 and complete fertilizer plants throughout the world. For information on the complete range of D-O engineering services available to the Fertilizer Industry, write to Dorr-Oliver Inc., Stamford, Connecticut.



DORR-OLIVER

WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT

One contract already signed is with Helix Co., subsidiary of Northern Natural Gas Co., Omaha, Neb. Helix will build a Bushton, Kan., plant to yield a mixture containing at least 60% helium, for underground storage by Interior at Cliffside Field in Texas.

Plant is expected on stream in 17 months, will be able to turn out 700 million cu. ft./yr. of helium. The government will pay Helix \$11.24/1,000 cu. ft. of helium content, and provision has been made for price escalation during the 22-year life of the contract.

A similar contract has been signed with a Cities Service Co. subsidiary, Cities Service Helix, Inc. Latter's plant will be near Ulysses, Kan., will also produce a 60%-helium stream, at a rate of 600 million cu. ft./yr. Cities Service will process a leaner gas than the feedstock at Bushton, accordingly will receive \$11.78/1,000 cu. ft.

Into September, the government had other contracts nearly completed with Helium Conservation Corp., Midland, Tex., and Panhandle Eastern Pipe Line Co., Kansas City, Mo.

Meanwhile, Interior has initiated an increase in the wholesale price of pure helium, from \$19 to \$35/1,000 cu. ft., to make the conservation program self-liquidating after 25 years. The increase, which may be in effect by November, will affect all wholesale buyers—including government agencies, which account for about 90% of all U.S. helium consumption.

A new butyl rubber, with ten times the usual ozone resistance, has been unveiled by Enjay Chemical Co. The trick: a cyclic diene is polymerized with isobutylene, replacing the isoprene used in standard butyl. Unsaturation in the cyclic configuration is less susceptible to ozone attack than is unsaturation in linear molecules.

Uncoked coal fed to blast furnaces boosts yields, eases operation

Adding coal to blast furnaces can reduce normal coke requirements by 20%, reports National Steel Corp., Pittsburgh. The firm has successfully used a coal injection system on an experimental blast furnace at its Hanna Furnace Corp.'s Buffalo, N. Y., plant.

Other advantages claimed for coal injection include savings in fuel and investment, improved efficiency and increased production. These follow closely the results obtained in other furnaces where natural gas or fuel oil was introduced at the expense of coke.

In operation, coal to be used in the Hanna furnace is crushed and screened, then fluidized in a storage tank, from which it is fed pneumatically into the furnace through stainless steel lances.

Coal injection may be a shot in the arm to struggling coal producers who, having seen blast furnace coke requirements drop in the past 15 years from 1,900 to less than 1,500 lb. per ton of pig iron, fear deeper inroads as gas and oil injection becomes more common. Coal injection can also conserve the nation's dwindling stock of high-grade metallurgical coal, since the system can utilize several grades of noncoking coal.

American Potash & Chemical is going to build a titanium dioxide plant at Mohave, Calif., providing the first TiO_2 source west of the Mississippi. Industry speculation is that for its raw material the firm will tap the titanium-bearing black sand that exists in the area.

Rayon loses ground in tire-cord battle; nylon picks up speed

Latest Dept. of Commerce figures on tire-cord production paint a bright picture for nylon makers. According to the department, during the second quarter of 1961, output of rayon (Tyrex) cord declined 20% to 45.3 million lb., while output of nylon cord climbed 41% to 43 million lb., compared with first-quarter figures.

Nylon's success in capturing the major share of the replacement-tire market again raises the question that has long tantalized nylon producers: How long will it be before nylon penetrates the original-equipment market? While Akron tire men seem generally agreed that nylon tire cord makes a superior tire, Detroit auto manufacturers have stayed away from nylon tires because of their higher price and flat-spotting.

Remedies for these two drawbacks may be

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in the making, however. For flat-spotting, Du Pont now has a nylon tire cord in Akron for evaluation that it hopes will eliminate nylon's "morning sickness."

As for price, the 1.7 lb. of nylon cord used in a typical 7.50 x 14 tire now costs \$1.55, while the equivalent 2.5 lb. of rayon cord costs \$1.25. But with new nylon 6 capacity coming on stream, nylon price cuts seem probable.

Tire makers, who have successfully played rayon makers against nylon makers, may be able to do the same thing between nylon 6 and nylon 6,6. Nylon 6 (made by Allied, Beaunit Mills and American Enka) has two main differences from Du Pont and Chemstrand's 6,6 variety: greater water absorption, which means that tire makers must exclude water from manufacturing processes, and a lower melting point.

There have been reports that this difference in properties might lead to a 10% lower price for nylon 6. Makers of nylon 6 would certainly resist this, but the additional capacity is sure to sharpen competition between the two nylon relatives.

Industrial spying charges bring lawsuits in U. S. and Europe

In one of the more bizarre cases of industrial spying uncovered in recent years, a host of lawsuits on two continents are facing Robert S. Aries and other employees of Aries' Stamford, Conn., consulting firm.

Latest action in a widening circle of spying disclosures is a civil suit filed in southern New York U. S. District Court by Rohm & Haas Co. That firm charges that Aries' associate Albert P. Sachs sold material obtained illegally from the company's secret files.

According to Rohm & Haas, Sachs and Aries paid a chemical engineer to rifle confidential files in the company's research department. To allow overnight duplication of documents, Aries supplied the engineer with a photocopying machine so that the records could be returned the next day before they were missed. Information thus obtained, Rohm & Haas charges, was sold to companies in France, Germany and Japan.

A previous stolen-secret suit by Merck & Co. against Aries (*Chementator*, Aug. 22, 1960, p. 45) has resulted in two criminal indictments by grand juries in New Jersey and Connecticut. Extradition proceedings are under way against Aries, who is now living in Europe.

Another lawsuit stemming from the alleged theft of Merck secrets has been filed in Swiss courts by F. Hoffmann-La Roche & Co., Ltd., Basel, Switzerland. That firm charges that it unknowingly bought data from Aries and spent considerable sums filing for patents, which then had to be withdrawn when it was discovered that the information had been stolen from Merck.

Sprague Electric Co., North Adams, Mass., has also filed suit against Aries. It alleges that an engineer on his payroll infiltrated the company to steal data on tantalum capacitors, which Aries then sold to overseas companies.

Turn to solid propellants promises big-tonnage chemical markets

If solids win from liquids the privilege of propelling a man to the moon, market-hungry members of the chemical industry can join the celebration. One observer estimates that between now and the first full-scale Nova moon shot, 4 million lb. of solid binder and 12 million lb. of oxidizer could go into the effort.

Brought back into the space-booster picture by the Administration's newly launched all-out push for the moon, solid propellants will be competing with liquids over the next two or three years for use in Project Nova. Nova's 12-million-lb. first-stage thrust is designed to send a three-man Apollo vehicle to the moon.

Magnitude of chemicals consumption involved can be gained from existing industry activity in the space field. For example, here is Aerojet-General's projected solid-rocket timetable: last month, the company fired its second 500,000-lb.-thrust segmented solid rocket, which used around 72 tons of propellant, about 20% binder and 80% oxidizer. By the last quarter of 1962, it expects to fire the center section of a 160 to 180-in.-dia. three-segmented solid rocket that will develop over 1-million-lb. thrust; weight of propellant in the three sections will be 225 tons. By 1963, company thinks it could fire a full-size cluster made up of 180-in.-dia. rockets, making a total thrust of some 3 million lb. By early 1964, it feels the full-scale power plant will be ready for launching.

Solid propellants are simple mixtures of materials, such as ammonium perchlorate as oxidizer, and polyurethanes or polybutadienes as binder.

For More Industry & Economic News . . . p. 68



Anticipation

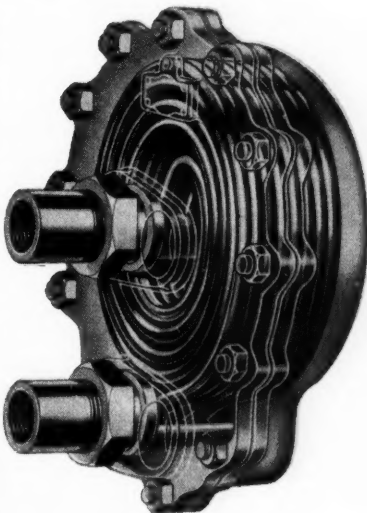
It isn't always greater than realization

The proof of the pudding, as they say, is in the eating. The Graham Heliflow Heat Exchanger—in thousands of installations—has given far more satisfying results than its users had anticipated—and by a generous margin! Not only from the standpoint of BTUs per dollars invested but because of the complete lack of maintenance, or any trouble whatever.

This extremely compact and rugged heat exchanger is a real "bearcat" for performance. Heliflow embodies the biggest single improvement in heat exchanger design within this century.

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Yes, the proof is in the eating, as those thousands of users have found. If you want your problem licked call our nearest sales engineer; he is trained to serve up the answers to your needs.



Phantom view showing unique Heliflow construction

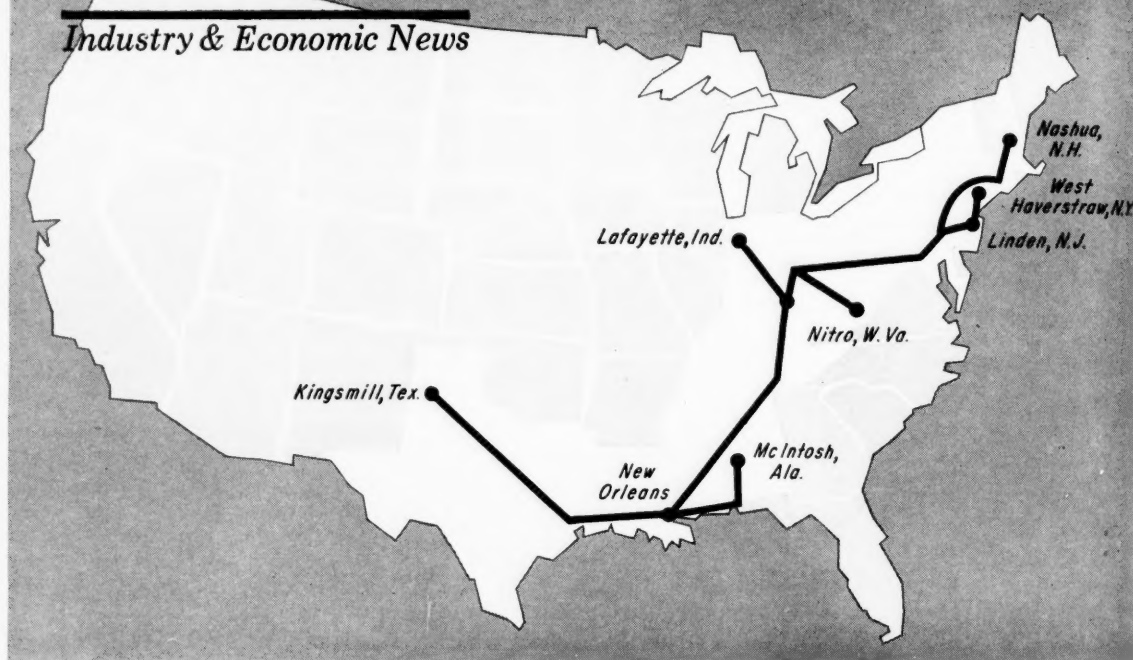
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VAST SAFETY NETWORK CHECKMATES CPI TRAGEDIES WITH PROGRAM THAT FOLLOWS HCN IN TRANSIT

American Cyanamid plays safe with hydrocyanic acid explosions and asphyxia by assuming accidents will happen—so being ready when they do.

Alarmist? The speaker is Stanley F. Spence, director of safety and loss-prevention for American Cyanamid Co.*

"Unless responsible trade associations and industries wake up and act, the years ahead will see many needless injuries and deaths, many millions of dollars lost in ruined shipments, and many reams of restrictive legislation. And all because there are too many transportation wrecks resulting in fires and explosions."

Spence's greatest immediate concern is the transportation of explosive or toxic chemicals. Under his direction, Cyanamid now regulates

its cross-country shipping of hydrocyanic acid under a vast safety network.

A basic part of the program is a manual that contains detailed instructions for handling virtually every emergency that could possibly occur to HCN shipments enroute. Well might this program serve as a model for other CPI firms.

► **The Program's Outline** — Tank cars of HCN are regularly shipped from Cyanamid's Fortier, La., plant to customers sprawled from Texas to New Hampshire (see map). As a car moves along the rails, it passes from one clearly zoned area of jurisdiction to another—from the responsibility of the manager or other designated individual at one of the company's plants, to that of a similar individual at its next plant along the train's route.

In case of derailment or other emergency within his zone, this man is on call 24 hours a day—backed by a task force of trained personnel, up-to-date timetables of all modes of transportation to the scene of the accident, a bulky man-

ual of prearranged instructions, and even preprinted news releases for the press.

► **How It Works** — Notices are posted both on the HCN tank cars themselves and on the conductor's waybill, describing the characteristics of the cargo and what immediate precautions should be taken in case of accident. Clearly indicated is the phone number of the Bureau of Explosives of the Assn. of American Railroads, as well as two "clearing house" Cyanamid phones.

The Cyanamid phones are at the firm's Fortier plant in New Orleans, and its Warners facility in Linden, N. J. The tank car and waybill notices stipulate that Fortier be phoned if the accident takes place south of Cincinnati; Warners, for Cincinnati itself and points to the north.

When an emergency call is received at either control center, the switchboard operator holds the caller on the line while summoning the designated individual. Using a prepared questionnaire, he deter-

* Speaking on "Safety in the Transportation of Chemicals," to the Chemical Industry Committee of Maryland, on May 23 in Baltimore.

Cyanamid's Safety Zones for Shipping HCN

From the firm's Fortier plant in New Orleans, tankcars of HCN are shipped to:

Destination	Safety zone	During this section of the tank car's route	Cyanamid's plant in this city is responsible
Linden, N. J.	1	New Orleans, La., to Birmingham, Ala.	New Orleans, La.
	2	Birmingham, Ala., to Danville, Ky.	Chattanooga, Tenn.
	3	Danville, Ky., to Chillicothe, Ohio	Hamilton, Ohio
	4	Chillicothe, Ohio, to Hagerstown, Md.	Marietta, Ohio
	5	Hagerstown, Md., to Linden, N. J.	Linden, N. J.
Kingsmill, Tex.	6	New Orleans, La., to Beaumont, Tex.	New Orleans, La.
	7	Beaumont, Tex., to Kingsmill, Tex.	Fort Worth, Tex.
McIntosh, Ala.	8	New Orleans, La., to Gulfport, Miss.	New Orleans, La.
	9	Gulfport, Miss., to McIntosh, Ala.	Mobile, Ala.
West Haverstraw, N. Y.	10	Tank car goes through zones 1-4, then: Hagerstown, Md., to West Haverstraw, N. Y.	Linden, N. J.
Nitro, W. Va.		Tank car goes through zones 1-2, then:	
	11	Danville, Ky., to Columbus, Ohio	Hamilton, Ohio
	12	Columbus, Ohio, to Nitro, W. Va.	Marietta, Ohio
Belle, W. Va.		Tank car goes through zones 1, 2 and 11, then:	
	13	Columbus, Ohio, to Belle, W. Va.	Marietta, Ohio
Lafayette, Ind.		Tank car goes through zones 1-2, then:	
	14	Danville, Ky., to Lafayette, Ind.	Hamilton, Ohio
Nashua, N. H.		Tank car goes through zones 1-4, then:	
	15	Hagerstown, Md., to Warwick, N. Y.	Linden, N. J.
	16	Warwick, N. Y., to Poughkeepsie, N. Y.	Pearl River, N. Y.
	17	Poughkeepsie, N. Y. to Derby, Conn.	Danbury, Conn.
	18	Derby, Conn., to Worcester, Mass.	Wallingford, Conn.
	19	Worcester, Mass., to Nashua, N. H.	Boston, Mass.

mines from the caller all relevant data. On hand are alphabetical and geographical listings of every town through or near which the tank cars pass, and both railroad and highway maps of the surrounding areas. With these listings, he locates the site of the accident within seconds.

He completes the call by relaying to the caller whatever immediate steps need to be taken. He next decides—or rather, the completed questionnaire decides for him—whether or not the situation requires activation of the HCN Tank Car Emergency Procedure; if so, he immediately places the procedure into effect.

► **Immediate Actions**—Upon activation of the emergency procedure, the following principal actions take place:

(a) The manager of that Cyanamid plant responsible for the safety zone in which the accident has occurred is phoned (*see table*). He leaves immediately for the site, contacting state and local police and others, as the occasion demands. At the site, he acts as the firm's representative in coordinating all action and enlisting all aid that may be required.

(b) The HCN emergency crew is called, instructed on rendezvous, and dispatched. (The emergency kit at each plant contains complete airline and railroad timetables, which are kept current. Arrangements have been made for space, ticketing and cash.)

(c) Notification is made to the other terminal plant (Fortier or Warners) of the situation and the actions being taken.

(d) Company headquarters in New York is notified. Those informed include the departments of safety and loss-prevention, corporate insurance, and public relations.

► **At the Site**—Actions to be taken at the site depend on the circumstances, of course. But the instruction manual lays down some general rules:

(a) Before any work is commenced on the tank car, the wind direction is to be determined and the area monitored for HCN concentration (6-41% HCN by volume

in air is explosive; 10 ppm. is the toxic threshold).

(b) The contaminated area must be cleared of all personnel except the emergency crew. Not even the company's coordinating official is allowed within the area.

(c) Qualified first-aiders and equipment must be present before emergency crew can enter area.

(d) Crew must observe the buddy system.

(e) If the tank car must be taken to a shop for repairs, a company representative must go along, staying with it during its repair and until its release.

► **Uncommon Sense**—The manual's instructions are only common sense. What is uncommon is the fact that the manual exists. For planned in advance is virtually every move to be taken in virtually every circumstance—before the circumstance arises.

New Organic Acids Claimed To Make Stable Resins

Five months from now, a new family of synthetic organic acids will be issuing from a \$6-million plant now under construction at Shell Oil's chemical works, in Pernis, near Rotterdam, Holland. The new compounds, trademarked Versatic acids, are said to have unique properties, making them desirable for use in plastics, rubbers, and metal processing.

Versatic acids are completely saturated and have a highly substituted carbon atom adjacent to the carboxylic group; 90% of the molecules have two substituted groups on the alpha carbon, remaining 10% has one substitution.

Shell says the acids are produced from olefins, carbon monoxide and water. Details, such as how substitution on the carbon adjacent to the carboxylic group is accomplished, are not available. Industry observers believe, however, that the process involves a modification of the oxo hydrogenolysis of alpha olefins.

According to Shell, the high de-

Naturally, there are loopholes: mainly, human frailty. For example, in the Southern Railway derailment last January near Chamblee, Ga. (in which a 10,000-gal. HCN tank car rolled down a 20-ft. embankment and came to rest with a boxcar perched atop it), no one phoned Cyanamid until two days after the wreck.

Description of the cargo and instructions on the tank car were in no way marred by the accident, though they may have been covered until the box car was removed a few hours later; it was simply that no one saw fit to follow the clearly posted instructions.

Withal, Cyanamid has taken a giant step in the safety field. The basic principle on which its HCN emergency setup is founded has long been known, though seldom acted on—Murphy's Law: "If anything can go wrong, it will."—EKS

gree of branching in Versatic acids gives a great stability against hydrolysis in the esters that are made from them. Also, new resins of exceptional chemical stability can be synthesized.

Apparently, the company has overcome esterification problems stemming from the Versatic acids steric hindrance, but will not say whether mineral acid or metal halide catalysts are employed.

Stronger Steel Vessels Via Cryogenic Stretching

Stronger stainless steel vessels and tubing can result from a new metalworking process that employs cold, rather than conventional heat, treating. Developed by Arde-Portland, Inc., Paramus, N. J., the method is said to be less expensive than alternative treating processes.

Called Ardeforming, the process starts with an undersize vessel that is made from austenitic stainless sheet. Heads or end closures are then welded on to form closed cylinders.

The preform is placed inside a stainless steel forming die, which is in turn inside a tank filled with liquid nitrogen. The preform is also filled with liquid nitrogen and sealed except for a gas pressurizing line.

After the preform cools to liquid nitrogen temperature, it is expanded to the dimensions of the die by high-pressure nitrogen gas. When depressurized and removed, the vessel is ready for final machining.

One big advantage of the method is that kinks, bends and distortions introduced during fabrication of the vessel are removed during the stretching operation. Also, stretching serves as a proof-test of the vessel, since a unit that successfully comes through stretching will also pass a final hydrotest; hence final machining and hydrotesting of defective units is eliminated by the method.

Vessels fabricated from Type 301 stainless steel have been stretched about 13% in diameter, with a tensile-strength increase from 200,000-220,000 psi. to 260,000 psi.

Hopper Cars Gain Favor For Shipping Polyethylene

Bulk shipping of polyethylene in railroad hopper cars assumes increased importance next month when 50 Dry-Flo Chem cars go to work for the Texas Div. of Dow Chemical Co.

Hopper car shipments in amounts of over 100,000 lb. per car are replacing shipments of bagged PE, particularly to large-volume users. It is estimated that over 60% of total PE production will be shipped in hopper cars within the next year.

Built by General American Transportation Corp., the cars have three 40,000-lb.-capacity compartments, can handle different types of PE in the same load. Pneumatic conveying systems load and unload the plastic-lined dust-tight cars, which require about 8 hr. to fill through hatches in the top of the carrier.

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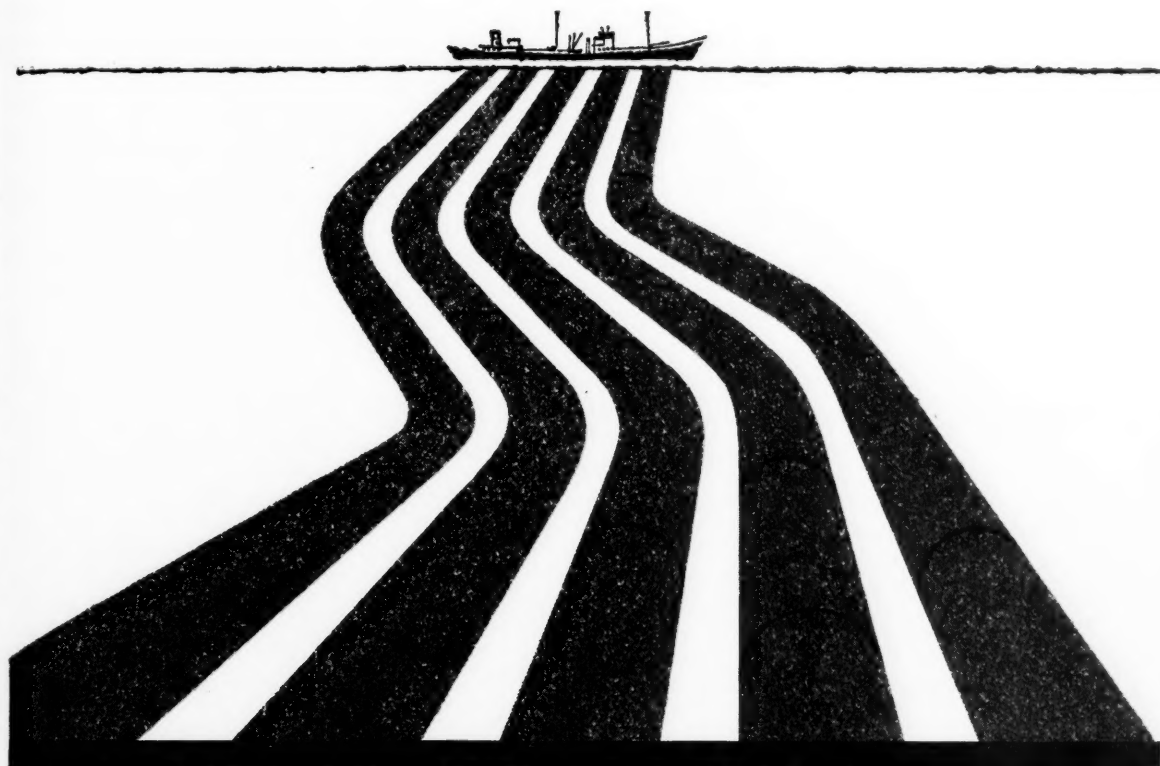
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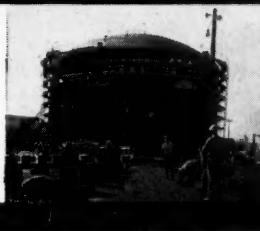
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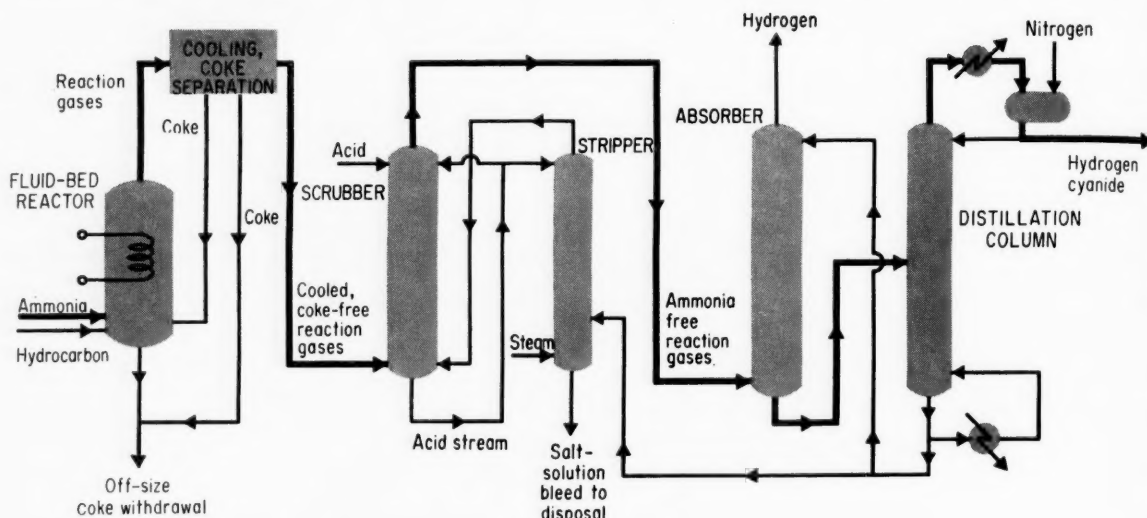
The world's first plant specifically designed to make refrigerated liquefied petroleum gas available for tanker shipment is being built by the Arabian American Oil Company in Ras Tanura, Saudi Arabia. Moistureproof, incombustible FOAMGLAS insulation manufactured by Pittsburgh Corning plays a vital role in this \$7-million facility.

Butane, propane or a blend of the two will be produced at the rate of 4,000 barrels per day. This refrigerated processing in climatic temperatures that reach 120°F. puts tough demands on the insulation. FOAMGLAS, a cellular glass insulation, works best.

For example: steel tanks 108 feet in diameter and 49 feet high must store liquefied propane gas at -43°F. FOAMGLAS insulates these tanks from top to bottom to maintain this temperature; piping that contains compressed gas is overcoated with FOAMGLAS; equipment that must be kept completely moisture and vapor free is protected with FOAMGLAS.

Write for our Industrial Insulation Catalog. Pittsburgh Corning Corp., Dept. HH91, One Gateway Center, Pittsburgh 22, Pa. In Canada: 3333 Cavendish Blvd., Montreal, Quebec. For specifications and local offices, see our Chemical Engineering Catalog insert, pages 1495-1498.

PITTSBURGH
PC
CORNING



NONCATALYTIC REACTION BOOSTS HCN YIELD

New process employs fluidized bed of coke, electrically heated to 2,500-3,000 F., to maximize conversion, minimize formation of objectionable byproducts.

Details are now available on Shawinigan Chemicals Ltd.'s new process for the production of HCN from NH_3 and a light hydrocarbon such as propane or methane.

The process, which has been operated by the Quebec, Can., firm for a year, following several years of piloting:

- Increases yield 20-25%.
- Results in a water-free product of low NH_3 content.
- Cuts operating and maintenance costs.
- Eliminates tarry polymers that could foul heat-transfer surfaces.
- Produces byproduct hydrogen of 98% purity.

Main feature of the process is a novel reactor employing a fluidized bed of coke heated electrically in an environment free of catalyst or oxygen-bearing compounds.

The reactor comprises a refractory-lined vessel of unique design heated by a.c. electricity applied to

the coke bed through permanent electrodes. By this means, the reactor zone temperature is maintained at 2,500-3,000 F. and pressure is essentially atmospheric.

For proper operation, the coke bed must always be in adequate motion around the electrodes. A continuous path of contacting particles can cause excessive current transfer and local overheating, which could vaporize the carbon and agglomerate the coke particles.

Proper fluidization is insured by control of reactant-gas space velocities and the special configuration of the reactor.

► **Process Details**—The main reaction with propane is:



However, commercial natural gas (92% methane) or LPG can be used.

Hydrogen cyanide is recovered from the reaction gases (primarily hydrogen, HCN and nitrogen) by conventional scrubbing and absorption techniques, followed by purification and liquefaction (see flow-sheet).

The hydrogen, which is usually of high purity, is suitable for chemical uses.

Amount of unreacted ammonia in the effluent gases is very low. It can be neutralized with sulfuric acid

and bled from the recovery section to prevent ammonium salt buildup.

Absence of water and the low concentration of unreacted NH_3 minimize formation of "azulmic" acids (the undesirable polymerization products that are formed at high temperatures by HCN and NH_3 in presence of moisture), which reduce product yield and foul the heat-transfer surfaces.

Yield of hydrogen cyanide, based on ammonia or hydrocarbons, runs 85-90%, with about 0.3% unreacted or decomposed ammonia.

Particle life of coke is indefinite since the design includes recovery and recirculation of carbon that is formed during the reaction. In actual operation, a small net increase has been realized since the bulk of the unreacted hydrocarbon is decomposed to its elements.

Raw-material and energy consumption per lb. of HCN, based on propane feedstock is: propane, 0.64 lb.; ammonia, 0.74 lb., electricity, 2.7 kwh. The process manufactures HCN competitively, using \$0.008/kwh. power, \$0.05/gal. propane, or \$0.25/1,000 std. cu. ft. natural gas. About 38 std. cu. ft. of 98%-pure hydrogen are obtained.

Process is available from The Lummus Co., New York, which has licensed it from Shawinigan.—AVG

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SODIUM BOROHYDRIDE PLANT

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MHI's 10-acre sodium borohydride plant has a proven capability of producing in excess of 100% of rated capacity — of producing a product of highest purity and quality! Metal Hydrides Incorporated, the company that has pioneered hydride chemistry throughout the world is moving ahead . . . ready to supply any quantity of sodium borohydride in any form — amorphous powder, SWS (stabilized water solution) or in smooth, convenient sized pellets!

The time for you to move — is now! Those promising sodium borohydride based innovations or projects you ruled out in the past because of economics can be turned into profitable realities right now. Call or write MHI's Technical Service team, today!



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Metal Hydrides Incorporated

1000 Congress Street, Beverly, Massachusetts



CHEMICAL INTERMEDIATES . . . SHADED, BUT FLOURISHING

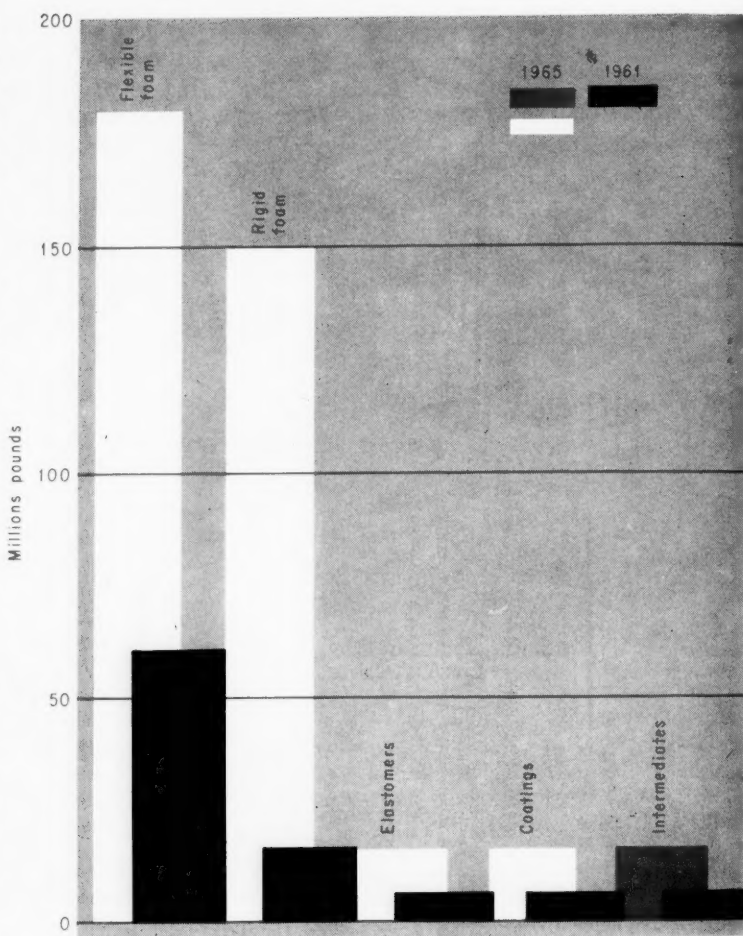
Though overshadowed by foams, volume of isocyanates used in intermediates approximates size of other nonfoam markets. Most sectors are expected to triple by 1965.

Shaded by the dazzling growth of their big-brother tolylenediisocyanate (TDI) in urethane foams, a wide range of specialty isocyanates have been winning favor as intermediates for pharmaceuticals and chemical specialties. An increasing number of these isocyanates are finding further uses, particularly in selective plant and animal pesticides, drugs for humans and animals.

With the total market approaching 100 million lb. for 1961, size of the market for miscellaneous isocyanates is variously estimated at from 1.5% to 7% of the total. Demand grew from a standing start five years ago when most of the products involved could be classed as laboratory reagents. Now, tonnage quantities are being turned out by three producers, two of them currently building new capacity.

With a plant starting up early in 1962, Mobay Chemical, Pittsburgh, will more than double its potential for a broad range of these organic intermediates. Also, Ott Chemical Co., Muskegon, Mich., will shortly expand its capacity for specialty isocyanates by 200%.

Mobay's expansion, adjacent to existing facilities at New Martinsville, W. Va., will be able to produce several hundred tons per month of intermediates including *m*-chlorophenyl, *p*-chlorophenyl, octadecyl, and phenyl isocyanates. Ott describes its existing capacity as tonnage-quantity. Current products are all substituted aryl monoisocyanates, though the company will soon start up facilities for aliphatic ethyl and methyl isocyanates.



The third producer, Carwin Co., North Haven, Conn., has an estimated 1 million lb./yr. of capacity divided between North Haven and Houston, Tex. Carwin makes no aryl monoisocyanates; it does make aliphatic ethyl, propyl, butyl and octadecyl isocyanates, as well as aryl diisocyanates.

► **What Markets**—Most of the specialty products are used in what may be broadly labeled pharmacological areas: drugs and pesticides. For example, in addition to their more familiar role in forming urethanes, isocyanates can also make carbamates. These function as

selective pesticides and are finding increasing use in a variety of fungicides, miticides, herbicides.

Currently, carbamate insecticides in particular are exciting considerable interest. Pound for pound, they are reported to be ten times as effective as DDT, are also free of toxicity, safe to the user. Insects' growing resistance to chlorinated insecticides reinforces the carbamates' appeal.

One big drawback that exists is price, which could run ten to twenty times as high as DDT. The only carbamate insecticide on the market is Union Carbide's Sevin. However,

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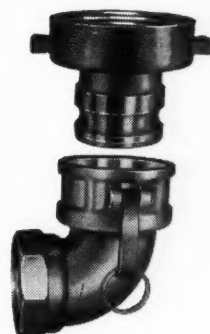
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several other firms are reported to be in varying stages of market development on additional carbamates.

The carbamate insecticides are aryl-N-methyl carbamate compounds (Sevin is 1-naphthyl-N-methyl carbamate). Precursors could be either substituted aryl monoisocyanates (plus methyl amine) or aliphatic methyl isocyanate (plus an aromatic hydroxy compound). In general, there seems to be no handy correlation between type of end use and chemical configuration of the isocyanate molecule. Octadecyl isocyanate finds use in surface-treating agents that make textiles and paper water-repellent and non-sticking. Yet *n*-butyl isocyanate finds its market in an oral drug that controls diabetes.

► **New Products** — New products include Ott's *o*- and *p*-tolylisocyanates and also the hard-to-synthesize meta isomer of dichlorophenyl isocyanate. None have been available before; all are aimed at pharmacological uses.

Hexamethylene diisocyanate is a new product that has the rare and coveted ability to produce nondiscoloring polyurethanes. As yet it is not available in the U.S. because it is corrosive, toxic and expensive, according to one industry spokesman.

Despite these drawbacks, however, Carwin announced recently that it has installed facilities to manufacture the material, which is also being made—mostly for captive use—by Bayer in Germany.

► **Scattered but Sizable** — Though the specialty isocyanates' share of the total market is comparable in size to the share going to coatings and elastomers, the latter are served almost exclusively by TDI and the only other nonspecialty product, *p,p'*-diphenylmethane diisocyanate (MDI). Growth rate of better than 30%/yr. between now and 1965 is expected for the intermediates, as well as for most other sectors of isocyanates consumption. The exception is rigid foams, which are expected to grow faster than 75%/yr.

Carwin looks to rigid foams to pull one of the company's specialties into volume use before long.

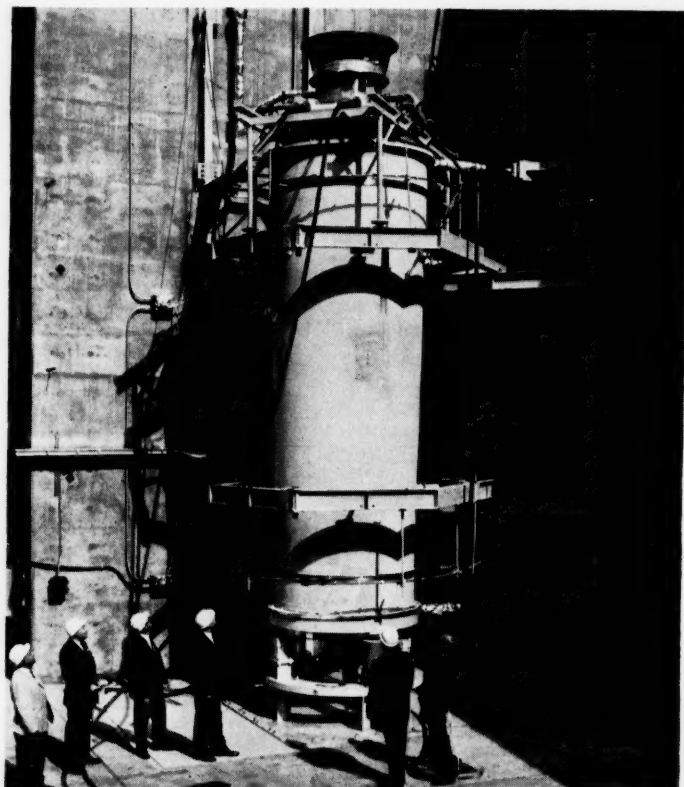
A low-molecular-weight polyisocyanate, called PAPI, facilitates building of foams with flame retardance and high strength-to-weight ratios. Both of these are key properties for construction, where rigid foams expect significant growth. Made by phosgenating an aniline-formaldehyde resin, PAPI could be sold in volume at prices competitive with TDI.

Another Carwin hopeful, bitolylenediisocyanate, is said to endow urethane rubbers with superior toughness. Now priced at \$2.50/lb., compared with MDI at \$1.25/lb., it is expected to remain a premium product, although the price will

come down somewhat as production increases. Prices of isocyanates as a whole range all the way from 70¢/lb. for TDI, to \$20/lb. for some exotic specialties.

Neither Ott nor Carwin makes TDI or MDI. Though Du Pont and Allied Chemical, like Mobay, are producers of the two large-volume materials, neither has entered the isocyanates intermediates field. All of the major producers are currently expanding production and a new entry, Nopco, Newark, N.J., has a TDI plant under construction. Capacity should reach 125 million lb./yr. by early 1962, more than double the 1960 figure.—FA

Solid-fueled engines move closer to big space role



Hoping to win a place for solid-fueled boosters in space probes, United Technology Corp., Sunnyvale, Calif., has successfully test-fired a segmented motor developing 250,000 lb. of thrust. Firm believes that the test engine, which contains 40 tons of propellant, will be forerunner of multimillion-lb.-thrust solid-fuel boosters.

BASIC for Process Control

Process engineers searching for a single source for a wide variety of products are sure to find the value of these American-Standard Controls Division products. This is true of anyone who must control or indicate the pressure or temperature of gases and fluids or electrical energy.

High Pressure Gauges

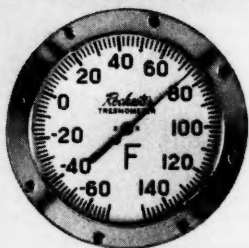


Accuracy plus elimination of recalibration are built-in features of the Rochester line of high pressure gauges manufactured by American-Standard Controls Division. No moving parts—no friction—makes it virtually impossible to wear out this gauge. Life expectancy is more than 250,000 cycles based on use from 0-50% of scale range. Available with adjustable mounting ring for flush or panel mounting. Dial size 4½" or 6". For pressure applications up to 10,000 psi.



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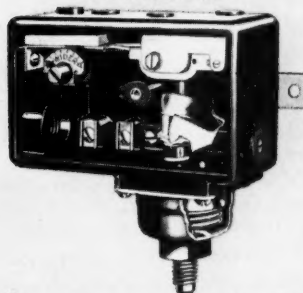
Rochester bimetal industrial dial thermometers provide extreme accuracy, are hermetically sealed and can be externally calibrated. Available in standard dial sizes from 1" to 5", and with scale ranges from minus 150°F to 1000°F.



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Sovfoto

Conference keynoter, Dr. John Turkevich, makes point with Soviet visitors during American Exhibit in Moscow.

CONFERENCE TO HEAR ABOUT SOVIET CHEMISTRY

New insights into Soviet advances in science and technology will be given at Chicago meeting by Princeton chemistry professor, John Turkevich.

The man pictured above giving a quick lecture to Soviet Premier Khrushchev and Deputy Premier Mikoyan is John Turkevich, professor of chemistry at Princeton University, who will be the keynote speaker at the upcoming "Conference on New Trends in Chemistry." The conference, sponsored by Armour Research Foundation and CHEMICAL ENGINEERING, will be held in Chicago on Oct. 11 and 12 at the Sheraton-Chicago Hotel.

Besides the keynote address, which will establish the framework for the two-day meeting, Dr. Turkevich will deliver a luncheon speech devoted to recent advances in Soviet chemistry and technology. Well acquainted with the Soviet Union,

he has just returned from a summer-long stay in Russia as a U. S. State Department scientific advisor.

The photo above was taken during the American National Exhibit, held in Moscow during the summer of 1959. Turkevich and his wife, Dr. Ludmilla Turkevich (who is a lecturer in romance languages at Princeton), were part of a group of American experts assigned to the exhibition. Both speak perfect Russian and got plenty of practice with the language answering thousands of questions on every conceivable aspect of American life.

Turkevich was representing the Atomic Energy Commission and the National Science Foundation at the exhibition. He recalls that "I had worked up a series of lectures on atomic energy, but soon found that the visitors had little interest in details except in regard to the atomic ship *Savannah*. This fascinated them because the Soviet government was working on an atomic icebreaker at the time."

The two-day Chicago conference

at which Turkevich is appearing will have five sessions on new chemical developments:

Session I, chaired by Aristid V. Grosse will have papers on "High-Temperature Chemistry" by J. L. Margrave and "High-Pressure Chemistry" by R. H. Wentorf, Jr.

Session II, with George S. Gordon, chairman, will include papers on "Solid-State Chemistry" by F. V. Schossberger, "Metallic Complexes" by A. E. Martell, and "Nonaqueous Chemistry" by J. L. Katz and Irving Sheft.

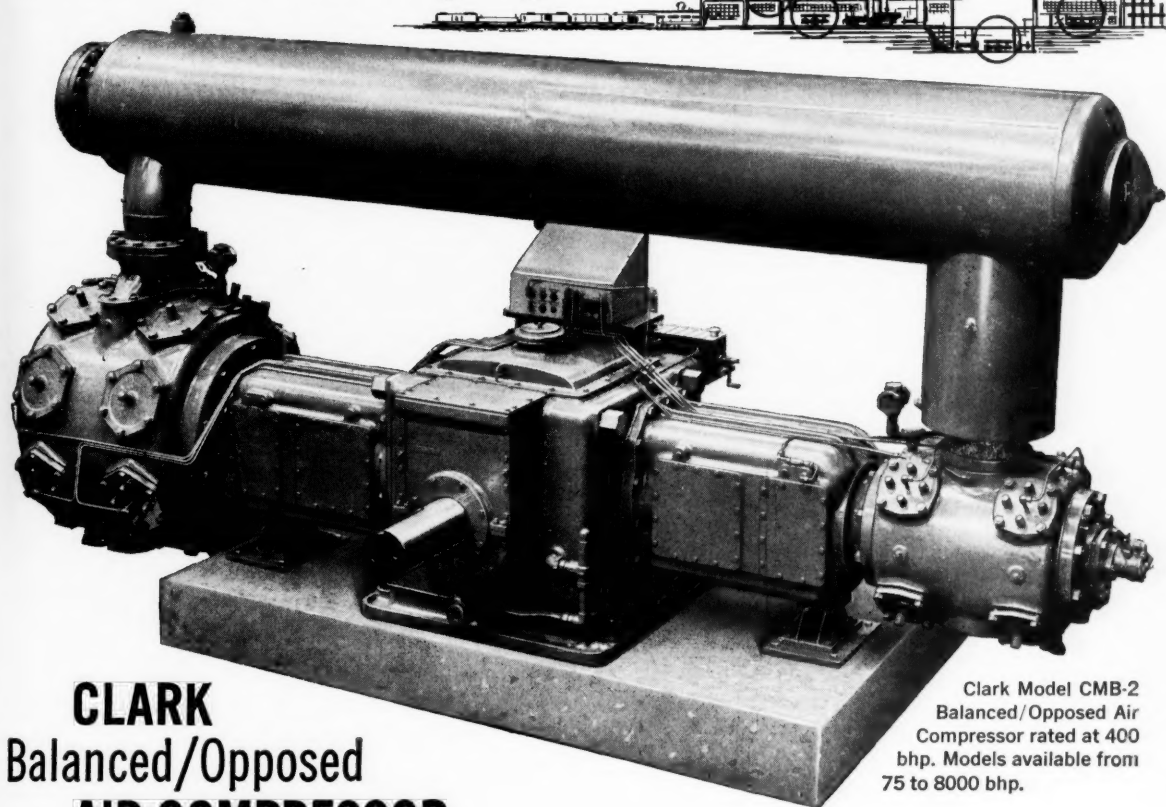
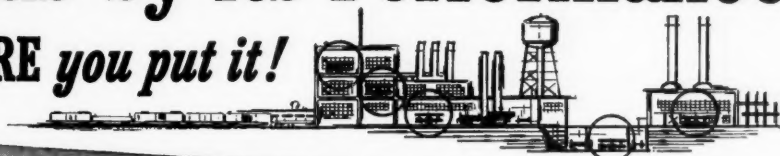
Session III, chaired by William P. Hettinger, will have papers on "Chemical Kinetics" by Martin Kilpatrick, "Chemical Thermodynam-

Register Now

Since attendance at the conference will be limited to 350, pre-registration is advised. Registration forms will be found on p. 80.

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October 11 and 12, 1961

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Registration fee for the conference is \$50, which covers preprints, two lunches, reception and banquet. To preregister, please fill in this form and mail with your check to: William Magee, Conference Secretary, Armour Research Foundation, Illinois Institute of Technology, 10 West 35th St., Chicago, 16, Ill. Make checks payable to Armour Research Foundation. Since registration will be limited to 350, advance registration is strongly recommended.

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If room at rate requested is unavailable, then one at nearest available rate will be reserved. Rooms will not be held after 6 P.M. unless requested above. Reservations will be confirmed by the hotel.

ics" by R. J. Tykodi, and "Catalysis" by Vladimir Haensel.

Session IV, with chairman Robert B. Mesrobian, will hear papers on "Inorganic Polymers" by G. Barth-Wehrenalp, "High Polymers" by H. F. Mark and S. M. Atlas, "Organic Semiconductors", H. Pohl.

Session V, chaired by Ellis P. Steinberg, will feature papers on "Radiation Chemistry" by P. Y. Feng, and "Ion Exchange Resins and Membranes" by H. P. Gregor.

General John B. Medaris (ret.), president of Lionel Corp., will deliver the feature banquet address.

He will discuss the most productive ways for small companies to organize their research and development efforts.

A complete program, containing abstracts of the papers, will be found in CHEMICAL ENGINEERING, Aug. 21, p. 74.

Specialties to Reverse Drop in Rubber Exports

Increasing foreign production has created expectations of a significant drop in U.S. synthetic rubber exports, which are estimated at about 320,000 long tons for 1961—compared with a high of 342,000 long tons in 1960. Since 1955, foreign demand has been on the rise, and has been met by American producers primarily because there was little or no production outside the U. S.

The growing foreign synthetic production, however, will be limited to the more-conventional types that are used primarily in tires, according to an analysis recently made by R. S. Earhart, manager of Goodyear International Corp.'s Chemical Div. Earhart expects any drop-off in regular exports to be offset by new demands for special-

grade rubbers aimed at such areas as shoe products, plastics, wire and cable.

Foams, Halogens: Keys to Plastics in Building

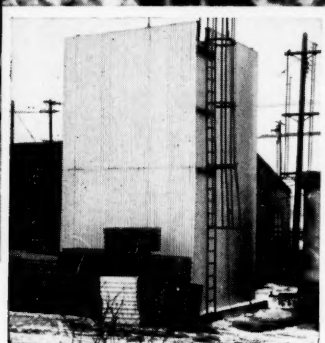
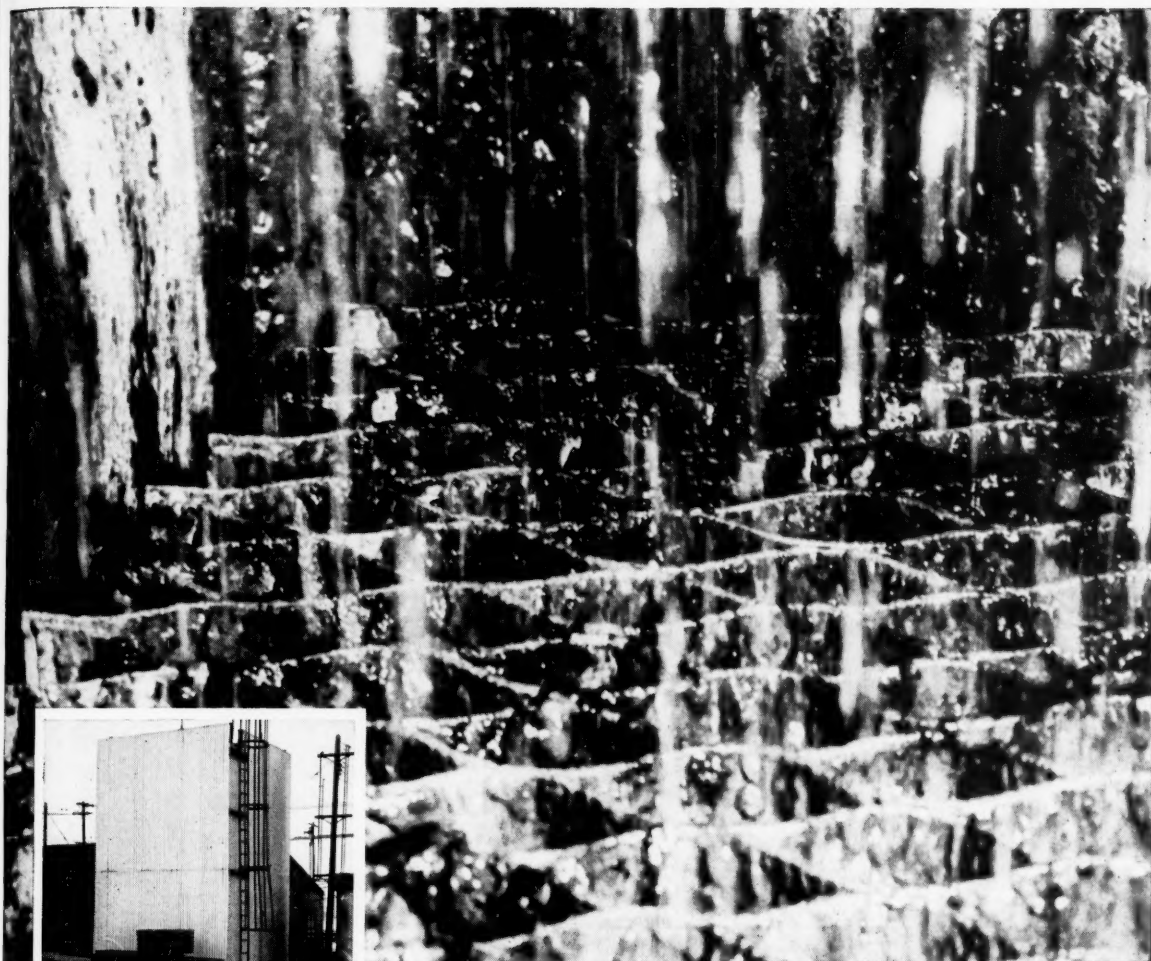
Value of plastics used in construction could soar to \$2 billion per year by 1965, according to recent estimates by James Margolis of Chemical Marketing & Research Co. He foresees a \$69-billion construction market in 1965, in which plastics, foams and halogenated resins can expect to capture 3% of the dollar volume.

Margolis estimates that usage of all plastic foams by then will add up to 750 million lb./yr., compared with an estimated 200 million lb. in 1961. Large-volume construction applications that are expected to

contribute heavily to foam sales growth are: paneling, ceilings, roof decking, pipe covering. Rigid polystyrene and urethane foams should show the greatest sales gains as a result of increased use in construction.

Based on the current lively activity of many chemical producers in research and commercial development, halogenated plastic polymers—now totaling about 20-million-lb./yr. production—could be produced at a 300-million-lb./yr. level by 1965.

Margolis anticipates the large-volume use of chlorinated urethane foams in construction products as a major lure to plastics producers. Reason for halogenated polymers' sales growth is found in their fire resistance plus good electrical insulation properties. This should increase use of these plastics as electrical insulators in hidden places in buildings, such as between floors, ceilings, and inside walls.



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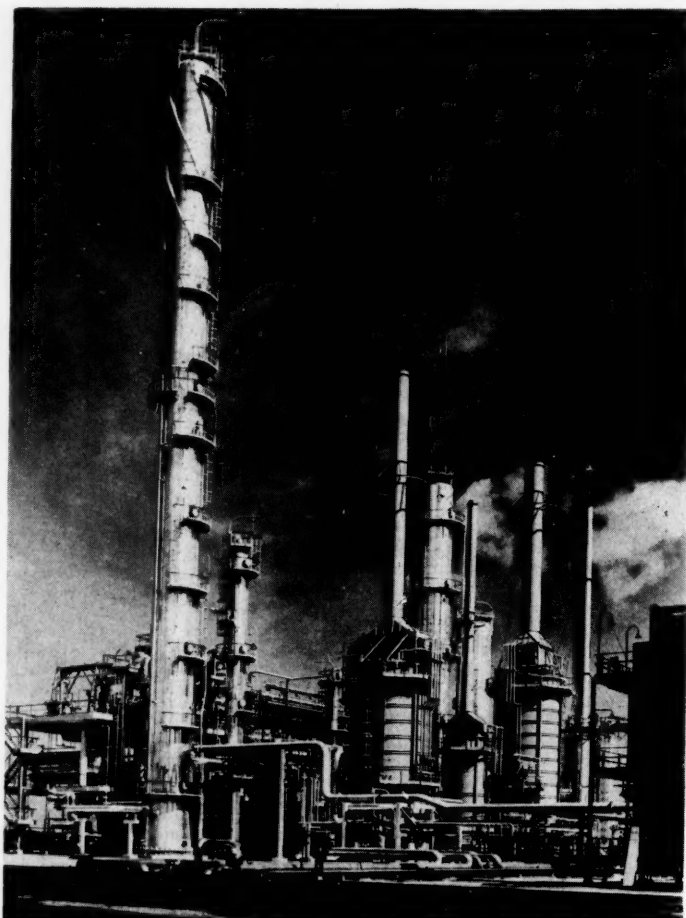
be rented or purchased, and D.I.S. engineers will help customers develop the most effective use of Dowpac for their particular waste conditions. Dow Industrial Service works with industries of every kind, anywhere in the U. S. Further, D.I.S. offers consulting laboratory service for water and waste treatment, backed by technical resources of THE DOW CHEMICAL COMPANY. For further information, write or call DOW INDUSTRIAL SERVICE, 20575 Center Ridge Road, Cleveland 16, O., Dept. CE9-18.

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Towering o-xylene capacity: 120 million lb./yr.



Now on stream at the Lake Charles, La., refinery of Cities Service Refining Corp. is the combination aromatics facility shown above: a 120-million-lb./yr. o-xylene unit and an 8,100-bbl./day Udex extraction plant. Unusual is the single 220-ft.-high fractionating tower to the left, which separates the ortho isomer from remaining xylenes (two or three columns are found at most installations). Engineered and constructed by Badger Mfg. Co., the combination plant gives Cities Service a raffinate stream for production of jet fuel blending stock, as well as an aromatic concentrate for use either as a charge stock for C₈ aromatic isomers and toluene or as a high-octane gasoline component.

Plants

Gulf Oil Corp. has released details on its plan to more than double ethylene capacity. A new 400-million-lb./yr. plant will be built on 1,000 acres some 30 miles east of

Houston, at Cedar Bayou near Mont Belvieu, Tex. Feed will be propane and ethane from the firm's Mont Belvieu natural gasoline facility. Due on stream in mid-1963, plant will form the nucleus of an extensive petrochemical complex—"additional facili-

ties, including a high-purity propylene plant" will be added "at an early date." Gulf chose the site chiefly for its proximity to the firm's existing 170-mi. ethylene-delivery pipeline.

California Chemical Co.'s Oronite Div. will build a 30-million-lb./yr. phthalic anhydride plant at California Oil Co.'s refinery in Perth Amboy, N. J. (Both firms are subsidiaries of Standard Oil Co. of California.) Feedstock will be o-xylene, the same used at Oronite's Richmond, Calif., phthalic facility—at which o-xylene capacity is currently being hiked to more than 100 million lb./yr. Construction at Perth Amboy begins immediately.

Kaiser Aluminum and Chemical Corp. now has all nine of its potlines at Chalmette, La., in operation for the first time since Aug. 6 of last year. The largest primary aluminum plant in the nation, Kaiser's Chalmette works now has capacity for about 247,500 tons/yr. of aluminum. (A potline is a series of 144 "pots," or electrolytic cells in which the metal is produced; hence, potline reactivation or shutdown is a reliable bellwether of the aluminum market.) One by one, beginning early in the spring of this year, Kaiser has reactivated a total of eight potlines in Washington, Louisiana and West Virginia (*Chem. Eng.*, June 26, p. 161; May 29, p. 123).

U.S. Atomic Energy Commission has authorized its Savannah River, S. C., complex to initiate a heavy-water reprocessing service. (No commercial facilities are available to perform this service.) Sole stipulation: reprocessing will only be done on deuterium originally purchased from the AEC. Charges will be set by Savannah River's cost of upgrading, based on the percent of deuterium oxide remaining in the spent material returned for reprocessing. Likely to benefit particularly from the service are our allied nations, to which

CPI News Briefs
continue on page 216

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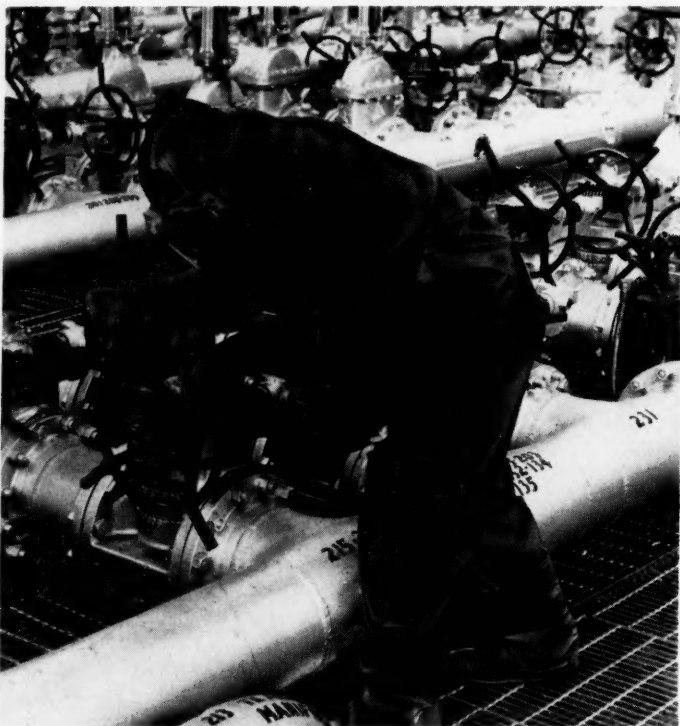
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CHEMICAL ENGINEERING—September 18, 1961

6124

83

Corrosion-resistant fabrics via fluorinated rubber



Although the suit modeled by the gentleman above is not as elegant as a Brooks Brothers original, it will protect the fellow inside from fuels, solvents and acids as corrosive as red fuming HNO_3 , because the fabric has been coated with Fluorel—a highly fluorinated synthetic rubber.

According to Minnesota Mining & Mfg., fabrics coated with this new compound not only are inert to corrosive chemicals but can also perform endlessly at 400 F. without change in properties, and won't crack at temperatures as low as -100 F. Currently available with either glass or Dacron as a base fabric, Fluorel-coated materials offer physical strength and abrasion resistance while maintaining unusual flexibility over a 500 F. range. Depending on base fabrics, tensile strength's range goes from 140 to 480 psi. and bursting strength from 310 to 650 psi.

Other applications for such fabrics include gaskets, diaphragms, corrosion-resistant hoses, flexible boots and bellows, high- and low-temperature flexible ducting and blast-deflection curtains.—Minnesota Mining & Mfg. Co., Irvington Div., St. Paul, Minn.

84A

Metal-plastic

Cost of die making processes can be cut in half by new product.

A new metal and plastic compound that claims to revolutionize tool and die making processes will soon be on the market. Developed jointly by Boeing and American-Marietta, the product should be

ideal for making low-cost tools used in forming thermosetting plastics. It is to be manufactured as a dry powder that, poured into a mold and liquefied by heat, will cool and harden quickly to the exact shape of the mold.

Boeing says that this still-unnamed material can be formed easily and has an exceptional bal-

ance of strength and heat conductivity—the strength of plastic and the heat conductivity of metal. It is sufficiently strong to operate at high temperatures and has higher heat conductivity than other metal-plastic tools now available. The material can be cast net size with tolerances as close as 0.001-in.

Cost of dies cast from the new material is reported as about half the cost of metal dies because the expensive machining and hand-finishing needed for metal dies can be eliminated. Strong and durable, tools cast from this compound can be used for production runs at considerable savings especially when a prototype tool is required or when tool design changes are frequent.

No further details have been disclosed, but aluminum chips and epoxy resin are believed to be a part of the compound. Applications are foreseen in tool production for such industries as aircraft, missiles, automobile, and in foundries, and plastic and metal-forming shops.—The Boeing Co., Seattle, Wash.

84B

Gold electroplating

Deposits from electroplating compound won't degrade at high temperature, will resist corrosion.

A new electroplating compound, Orotemp 24, consists of electronic-grade gold salts that can produce a stress-free, 24-Kt. satin-bright deposit on stainless steel, monel, Kovar and other alloys.

Aimed at gold plating of transistor headers and printed circuit boards, this product won't affect copper laminate or photo resists, and is said to create an excellent resist for chromic acid and ferric chloride etching agents. It is also extremely ductile: a 0.001-in. deposit on 0.020-in.-dia. wire will withstand bending around a 0.040-in. mandrel.

Gold salts in Orotemp 24 are neutral and contain no brighteners or free cyanide. Because of their high purity, they can coat metals with a tight-grained gold patina that won't discolor when heated



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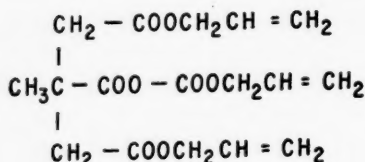
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and will have remarkable resistance to corrosion. Plated on Kovar, for example, Orotemp 24 deposits will withstand a 1-hr. exposure to air at 1,000 F., without color change. Plated objects do not degrade and can be soldered even after prolonged storage.—**Technic Inc., Providence, R. I.** 84C



Acetyl triallyl citrate

Polyunsaturated monomer shows promise in formulations of several resin systems.

Known as ATACTM, this new compound available in pilot-plant quantities is currently under investigation for possible applications in the fields of plastics, ceramics, glass—and missiles.

The monomer is a nearly colorless liquid. To prevent polymerization under normal storage conditions, the monomer can be stabilized by as little as 0.001% hydroquinone or tertiary butyl catechol, depending on the end use. With modest heat and the usual peroxide catalysts, it undergoes an easily controlled homopolymerization to a clear, hard thermoset resin. According to the manufacturer, a solid prepolymer with a melting range of 120-150 C. will be on the market soon.

Recent findings indicate that ATAC lends itself to formulations for glass cloth laminates of high tensile strength (61,000-63,000 psi.), impact (24.3-24.4 ft. lb./in., izod notched) and flexural strength (78,000-80,000 psi.). Such laminates can be produced at as little as 30-psi. pressure. Patent applications have been filed to cover a laminate system that consists of ATAC liquid prepolymer, maleic anhydride and styrene. Polymerization is catalyzed with tertiary butyl perbenzoate.

The monomer is also known to co-

polymerize with esters of acrylic and methacrylic acid, vinyl esters and other unsaturated systems such as acrylonitrile and triallyl cyanurate.

ATAC is not miscible with water but is miscible with all common solvents such as acetone, benzene, chloroform, dioxane, glacial acetic acid, dimethyl formamide.

Boiling point, 2mm. Hg.

142-143 C.

Refractive index

1.463-1.466

Brookfield viscosity, 100 F.

37.5 cp.

Spec. gravity

1.140

Flash-point

341 F.

Saponification number

605-650 (theory: 635)

Miles Chemical Co., Elkhart, Ind. 86A

Trimethyl phosphate

Exploratory studies indicate that compound may go into paints, insecticides, plastics.

After winning spurs as a gasoline additive (*Chem. Eng.*, July 24 p. 74), trimethyl phosphate, commonly known as TMP, is now stirring interest among industrial chemists. In its potential new applications, this compound shows particular promise as a methylating agent, chemical intermediate, flame-resistant solvent for paints and polymers, catalyst, and as an agent to increase the effectiveness

and activity of some insecticides.

As a methylating agent, for example, TMP has excellent potential for such purposes as converting acyclic hydroxy compounds into corresponding methyl ethers. It can convert aniline and methylamine to corresponding dimethyl derivatives in high yields.

The activity of insecticides containing fluorophosphine oxide increases when TMP is added to them. As a catalyst, it accelerates the hardening of urea formaldehyde resins and, when applied in thin coatings, increases the heat stability of other resins.

TMP can be used as a solvent in preparing solutions of polyvinylidene cyanide for spinning synthetic fibers in a water immersion bath. Copolymers of polyvinylidene cyanide can be handled similarly. Such applications may be useful in the manufacture of plastics, synthetic rubber and adhesives, as well as in flame-resistant solvents for paints.

This compound can also strip hydrogen cyanide from gas mixtures, will suppress electrostatic charges that arise when carbon dioxide is released from metallic containers.—**Ethyl Corp., New York.** 86B

Sarcosinate

Soaplike solution leaves no hard-water deposits, inhibits corrosion.

Described as the first of an entire family of acylated sarcosine de-

—Newsworthy Chemicals—

Page number is also reader service code number

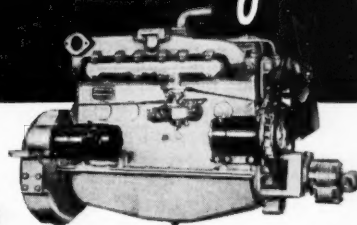
Fluorinated rubber gives corrosion resistance to fabrics.....	84A
Metal-plastic compound cuts cost of die making.....	84B
Neutral gold salts improve the electroplating of transistors.....	84C
Acetyl triallyl citrate can make interesting new resins.....	86A
Trimethyl phosphate may go into paints, plastics.....	86B
Sarcosinate solution acts as detergent, inhibits corrosion.....	86C
New alumina pellets boost efficiency of gas dehydration.....	88A
Alumina powders can effectively polish Si and Ge wafers.....	88B
New polystyrene crystals are uniform and clear.....	88C
Metal-filled silicone resins are now available.....	88D
Rubber-based epoxy adhesive can be used from -80 F. to 250 F.....	88E
Irradiated polyolefins act as insulators in coaxial cables.....	88F

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6 cylinders



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Allis-Chalmers' OWN — POWER-CRATER engine is engineered specifically for Allis-Chalmers lift trucks. Has unique crater-shaped combustion chamber that sets up violent swirling turbulence for thorough mixture of air and fuel, resulting in responsive power and maximum fuel economy.

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Sturdy steel channels move easily over bearing-mounted load rollers. New piston-type cylinder with patented, self-adjusting packing minimizes maintenance. New forks have rounded ends and long taper for easy entry under loads. Forks are easily spaced with new spring-loaded latch.

Have Your Allis-Chalmers Dealer Show You the Many Advantages of "F" Series Lift Trucks

Unusual grade-climbing ability due to power, balance and weight distribution. Familiar, automotive-type controls—wide, adjustable seat—unobstructed floor board. Easy, quick, maintenance accessibility.

Optional transmissions—constant-mesh, two-speed or POWER-SHIFT torque converter drive. Versatility of masts, carriages, forks and attachments.

For further information,
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Allis-Chalmers, Milwaukee 1, Wisconsin.



BH-177

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F 60-24
6,000-lb capacity

F 70-24
7,000-lb capacity

F 80-24
8,000-lb capacity

F 100-24
10,000-lb capacity

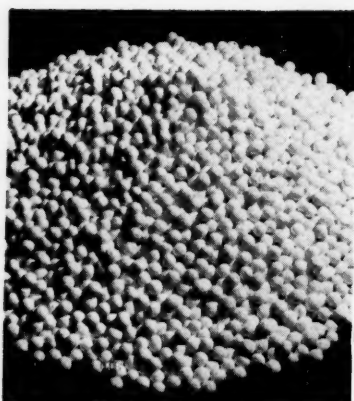
Special-Purpose trucks with
high underclearance, FS60
— 6,000-lb, FS70 — 7,000-lb,
FS80 — 8,000-lb capacity.

rivatives, Maprosyl 30 consists of a 30% aqueous solution of sodium lauroyl sarcosinate—considered as the purest on the market because of its clarity and low inorganic solids content.

Probably the least toxic anionic surfactant known, sodium lauroyl sarcosinate solution may be thought of as a chemically modified soap with all the latter's advantages (emolliency, detergency, freedom from irritation) but without its major disadvantage — formation of hard-water scum.

According to Onyx Chemical, the compound has maximum foaming and detergency in the alkaline and mildly pH range, and will greatly depress the cloud-point of anionic-based liquid formulations. Other properties are its corrosion-inhibiting power and solubility in highly alkaline systems. It can be used as a shampoo component.

Additional Maprosyls derived from fatty acid sarcosines (cocoyle, steauroyl, oleyl, linoleyl, myristyl) as well as several of their alkanolamine and inorganic salts are in pilot-plant production.—**Onyx Chemical Corp., Jersey City, N. J.** 86C



Active alumina

Free of impurities, new desiccant has long operating life.

With a surface area of 360 sq. meters/g., almost as large as a tennis court, these 1/4-in.-dia. alumina balls will scavenge water

out of natural gas, liquefied petroleum gas, air, NH_3 , N_2 , O_2 , CO_2 and H_2 . Called KA-101, this new adsorptive form of alumina differs from the industrial desiccant grades because its major crystalline phase consists of eta alumina. Such a phase comes from a progressive rearrangement and upgrading of the crystalline structure when alumina is heated.

Because of its thermal stability and structural strength, eta alumina desiccant is impervious to degradation from repeated reactivations, won't crumble or form dust.

In the drying of industrial gases, contaminants in the desiccant can form active centers on which some unsaturated hydrocarbons will polymerize, thus fouling the adsorption bed. But KA-101, made of pure alumina hydrate, has an extremely low level (less than 0.02%) of iron, silica or chlorides. Undesirable reactions during drying are thus minimized, and the bed's operating life is greatly increased.

Miscellaneous applications for KA-101 include breathers, air conditioning, packaging and instrumentation. It is also an effective catalyst carrier for several processes.—**Kaiser Aluminum & Chemical Corp., Oakland, Calif.** 88A

Briefs

Semiconductor-grade alumina in powder form can polish silicon and germanium wafers at tight quality control of stock removal and scratch rating. When used in conjunction with standard techniques (modified to prevent abrasive contamination during polishing), these powders give results superior to chemical etching in relation to surface flatness and exaggeration of existing surface flaws. Three powders are now available: Type 1.0C, Type 0.3A and Type 0.05B. They all contain less than 100 ppm of impurities.—**Linde Co., New York.** 88B

New polystyrene crystals have been introduced. One, Elrex 110R is a heat-resistant polystyrene (190-195 F.) that exhibits superior flow as well as good elongation and tensile strength; the other, Elrex 220E, is an easy-flowing grade of low strain and good balance between flow and physical properties.—**Rexall Chemical Co., Paramus, N. J.** 88C

Metal-filled silicone resins are rubber-like material that can fulfill many high- and low-temperature design requirements of consumer products, aircraft, electronics, and nuclear radiation shielding. Among the products available are lead-, bronze-, steel-, copper-, and aluminum-filled silicones, identified as Epocast H-1759.—**Furane Plastics Inc., Los Angeles.** 88D

Rubber-based epoxy adhesive, Rubbapox, although it contains neither water nor solvents and is 100% solids, requires no mixing before use. It is reported as excellent for laminating polystyrene foam, polyurethane foam and polyethylene foam to aluminum, steel and Cycloc. Rubbapox can also be used as caulking compound or waterproof sealer. Service temperature goes from -80 F. to 250 F.—**Rubba Inc., New York.** 88E

Irradiated polyolefin insulating materials, called Electrocel, will give coaxial cables a combination of superior heat resistance and toughness with low capacitance and reduced attenuation. They are suited for applications where space and weight savings—without loss of dielectric efficiency—are of major importance. The materials are available as insulation in coaxial cable with either irradiated or standard PVC jacketing.—**Radiation Materials Inc., Long Island City, N. Y.** 88F

For more information about any item in this department, circle its code number on the Reader Service Postcard (Page 265).

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BARREL-TO-BEARING
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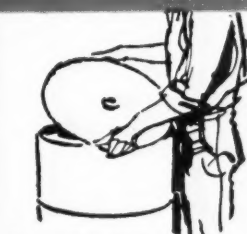
Included in a complete Alemite barrel-to-bearing lubrication method can be electric, air or hand-operated equipment. It will more than meet every need for high-pressure lubrication, filling hydraulic systems, servicing oil reservoirs, lubricating gear housings, and refilling grease guns.

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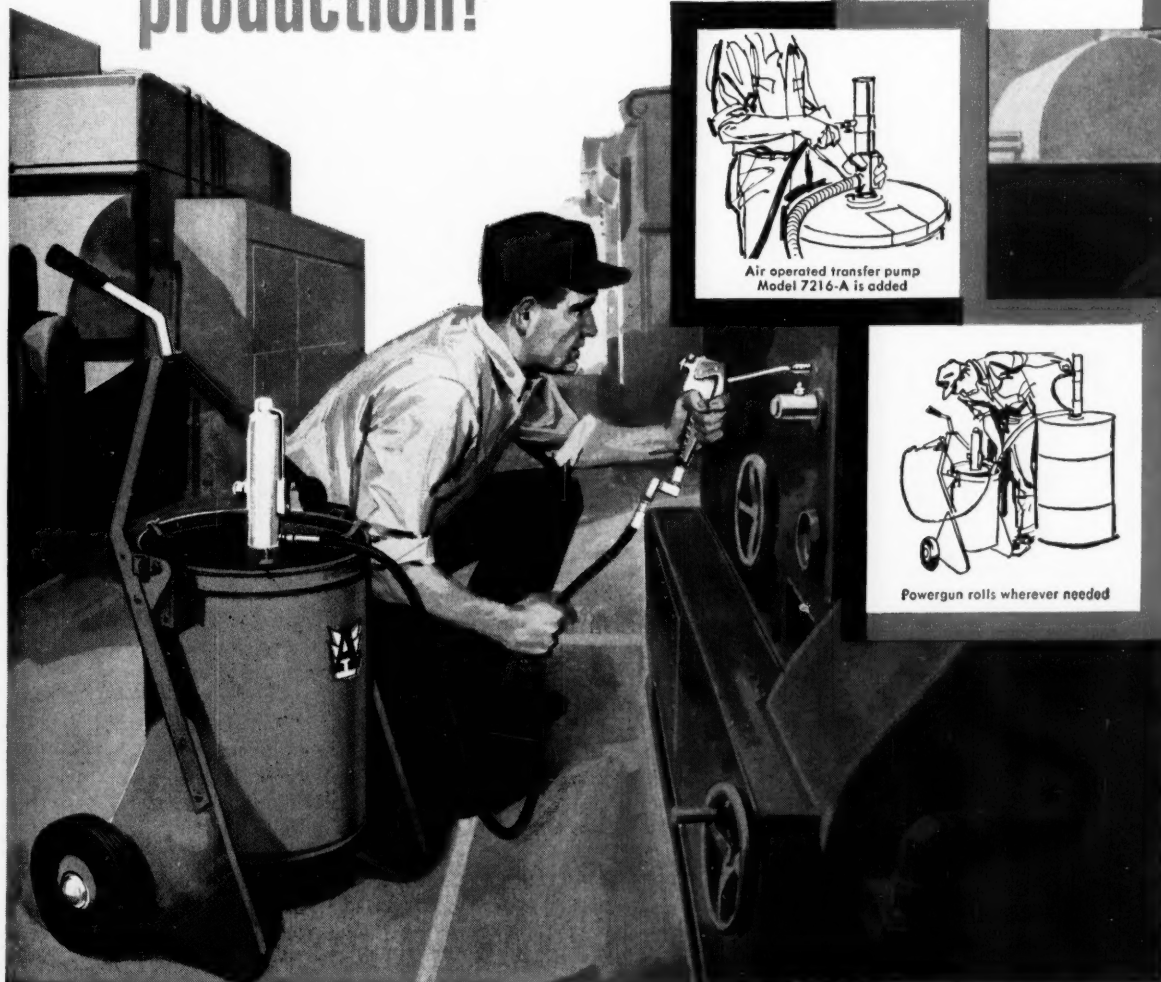
Cover protects 400 lb. drum



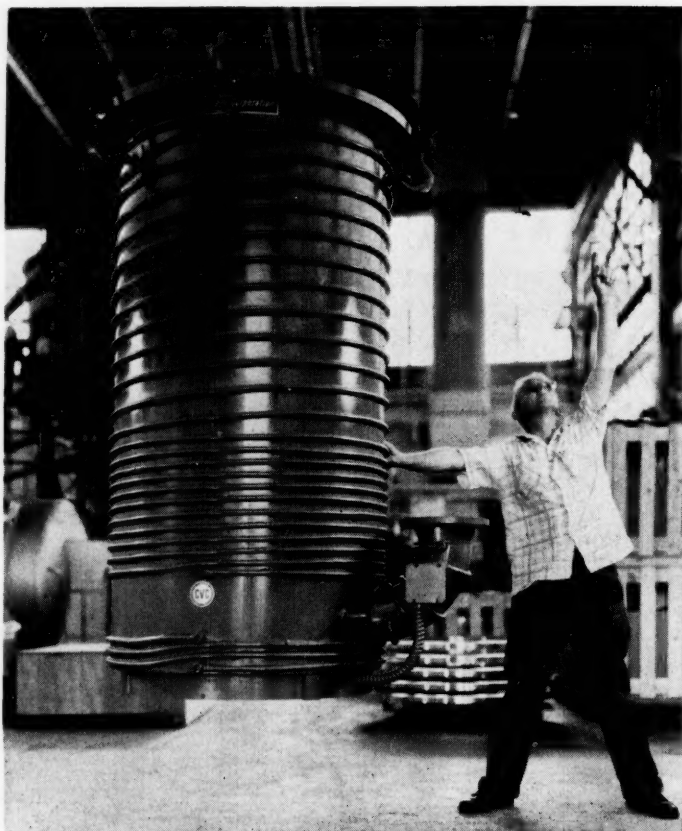
Air operated transfer pump
Model 7216-A is added



Powergun rolls wherever needed



No rocket, but space-simulating vacuum pump



Developed specifically for fast evacuation of very large chambers used in space-simulation studies, this high-vacuum pump is also suitable for large systems where production of very low pressures and handling of very large quantities of gas in a short time is essential. It is capable of handling 52,000 liters/sec. throughout the 3×10^{-4} to 4×10^{-4} mm. Hg pressure range.—Consolidated Vacuum Corp., Rochester, N. Y. 90A

Filtration equipment

Two units effectively scour small particles from liquid streams.

Two new filters remove particle contaminants from cooling water, condensate, process water and other liquids.

In a complete filtration system, tubular-element pressure filters of plastic or stainless steel knock out particles as small as 1 micron. Plastic elements are used up to 140 F., stainless steel for higher temperatures.

Filters are vertically mounted in

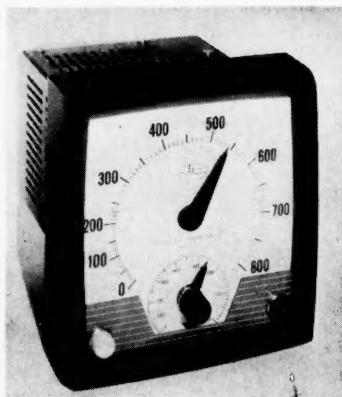
a tube sheet to provide the desired filter area. After precoating with filter aid, filtration is begun, using filter aid in the unfiltered solution to help build a porous cake and prolong the operating cycle.

For cake removal, air that is trapped in the high dome of the unit forces liquid back through the elements to slough off the cake. While the filter tank is draining, air is introduced to provide agitation and scrubbing action at the surface of the elements.—Hagan Chemicals & Controls, Inc., Pittsburgh. 90B

Another filter uses an element of braided plastic or wire that elongates and shrinks in diameter when pressure is applied. When pressure is removed, the filter returns to its original diameter and length, with each individual strand moving independently to clear the surface of cake.

No scraper or spray nozzles are needed to clean the flexible element. If desired, it can be manually or automatically shaken or rocked, to produce a new surface for each cycle.

For all types of liquid clarification, the strands of the element may be stainless steel, Monel, or any plastic that can be produced in a monofilament.—Filtmor Inc., Montclair, N. J. 90C



Indicating controller

It has front access, covers temperature range of -300 to $+2,000$ F.

An indicating temperature controller features front-panel control setting and a servo-controlled indicating dial. Maintenance and parts replacement is simplified by a hinged front and epoxy-encapsulated circuit plug-ins that withstand moisture, dust, vibration and environmental changes.

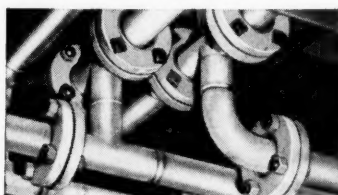
The series is available with three indicator types: indicator only, indicator only for multipoint use, and indicator for multi-channel control use. The servo indication system has up to five remote-location controls.

A Wheatstone bridge circuit

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**YOU CAN SAVE MONEY ON
PROCESS PIPING SYSTEMS!**

**IMPROVED FITTINGS DESIGN AND
NEW PIPING STANDARDS CUT COSTS!**



The ultimate installed cost of corrosion-resistant process lines *can* be substantially reduced . . . where pipe line design specifications take full advantage of up-to-date developments in improved fittings design and new piping standards.

The most recent issue of the Code for Pressure Piping, ASA B31.3-1959, allows use of *light wall* Stainless Steel Schedules 5 and 10 pipe and fittings for critical process lines to a degree not possible with *outdated* specifications. The broader scope of pressure-temperature operating conditions included in this new code, permits computations utilizing these more economical wall thicknesses. This, plus a specification recognizing the efficiency of Speedline fittings, guarantees a soundly designed system at a *lower* installed cost.

Every Speedline fitting has built-in advantages that contribute to lower installation cost because they are designed especially for use with light wall Schedules 5 and 10 pipe. Speedline's extra length feature means butt joints are easier to align and easier to weld because you're always connecting "straight to straight". There's ample clearance to attach flanges to any or all ends of a Speedline fitting without fouling—by expanding or welding. Speedline aligning connectors assure sound socket-joining for both pipe and fittings. With Speedline—*one fitting* does it all. Review your process piping specifications to be sure they call for all of the cost savings possible with light wall pipe and modern Speedline fittings.



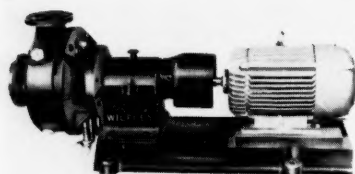
CORROSION-RESISTANT FITTINGS
STAINLESS STEEL • ALUMINUM • SPECIAL ALLOYS

100R

A PRODUCT OF HORACE T. POTTS COMPANY • 500 E. ERIE AVENUE, PHILADELPHIA 34, PA.

CHEMICAL ENGINEERING—September 18, 1961

provides a choice of four control modes covering the range from simple off-on through proportional and three-position operation. The device uses a fail-safe resistance sensing element.—**Electronic Processing Corp., San Francisco. 90D**

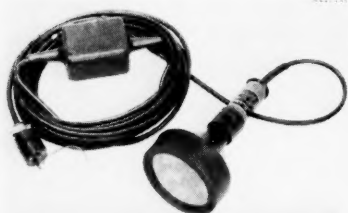


Acid pump

Steam-jacketed unit can handle ammonium nitrate, liquid sulfur.

Solutions that freeze above ambient temperatures are pumped by a steam-jacketed unit that has multiple steam line connections on the case, case plate and stationary seal-ring housing. Any two connections on each jacketed part may be connected to the incoming and return steam lines.

Designed to pump materials such as asphalt, sulfur, and ammonium nitrate, the pump contains the features that are common to standard acid pumps produced by the same manufacturer.—**A. R. Wilfley & Sons, Inc., Denver. 92A**



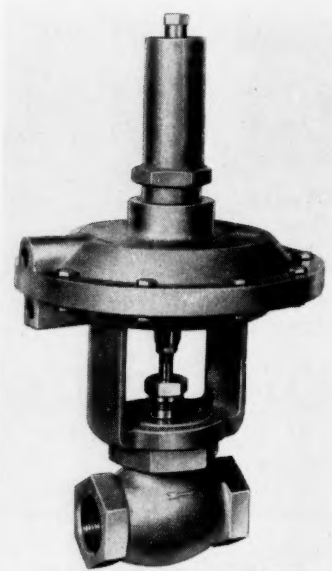
Trouble-shooting lamp

Producing 65,000 candlepower, it is safe near explosive materials.

A 110-v. lamp is perfectly safe to use near all types of powders and fuels. Entire assembly—lamp, 36-ft. cord and transformer—is

sealed in vulcanized rubber that insulates, seals out liquids and gases, and guards against sparks when dropped. The bulb is protected by a heavy tempered safety-glass plate against impact, and temperature changes.

Its sealed-beam lamp is designed to burn as long as 200 hr. Called Jetlite, the unit was tested under water, soaked in jet fuel, suspended in volatile vapors, and dropped from a height of 10 ft. It still worked satisfactorily after the tests.—**Burton Mfg. Co., El Segundo, Calif. 92B**

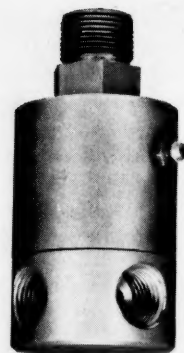


Diaphragm valve

Pneumatically actuated unit gives off-on limited throttling control.

For saturated steam service to 200 psi., and water, oil or gas service to 400 psi., a 1-to 3-in. diaphragm valve is available. A universal-type actuator may be quickly changed from air-to-open to air-to-close simply by reversing the spring assembly.

Diaphragm is made of neoprene with nylon reinforcing. Bronze bodies may have either Monel or stainless steel trim, depending on plug construction.—**Taylor Instrument Cos., Rochester, N.Y. 92C**

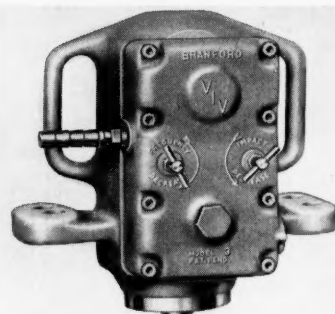


Rotating union

Unit can handle rotation to 5,000 rpm. at 100 psi. and 400 F.

Incorporating an end-face mechanical seal, lubricated ball bearing and interchangeable housings, a compact rotating union has a stainless steel rotor, brass housing and aluminum end cap. It handles a wide variety of liquids at rotation speeds up to 5,000 rpm.

Interchangeable end caps allow liquid flow to enter and exit at the same end or enter at one end and exit at the other. Disassembly, repair are quick, easy.—**Instronics Div. of Jani, Inc., Chicago. 92D**



Pneumatic vibrator

Unit's impact and frequency can be changed independently or together.

A pneumatic variable-impact vibrator can change impact and frequency independently of each other or together. Either characteristic is controlled by simply adjusting a handle on the device.

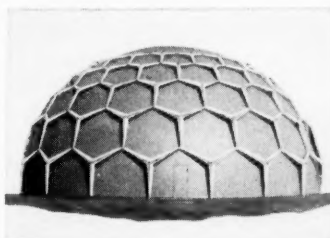
What's News in Rubber...



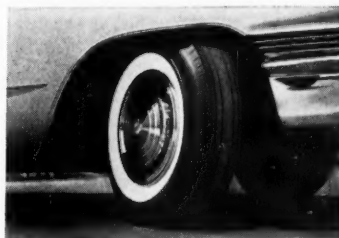
ENJAY BUTYL BEATS HEAT-WEATHER-WEAR

Continuous contact with materials as hot as 350°F (as in this conveyor belt) presents no problem to Enjay Butyl HT 10-66 when properly compounded for heat resistance. Actual service shows that other grades of Enjay Butyl also have exceptional resistance to high-temperature aging in ordinary atmospheres, oxygen or super-heated steam.

For application data, or for technical assistance in applying Butyl, write to Enjay, 15 West 51st Street, New York 19, New York.



Lightweight, durable, permanently flexible and applied cold, this colorful new roofing system at Longway Planetarium in Flint, Mich., takes full advantage of the unusual flexibility and non-hardening properties of Enjay Butyl.



New Enjay Butyl HT 10-66 adds toughness to air-holding innerliners which help assure correct inflation pressure on tubeless tires; gives greater blowout protection and improved tire-tread wear. Also used for sidewalls and chafer strips.

EXCITING NEW PRODUCTS THROUGH PETRO-CHEMISTRY

ENJAY CHEMICAL COMPANY

A DIVISION OF HUMBLE OIL & REFINING COMPANY



Operating in any plane, the vibrator has a frequency range of 1-500/min. Kinetic energy of the unit is said to be up to ten times that of a conventional vibrator while consuming considerably less air. It serves to compact powdered metals and ceramics and to move powdered or granular materials in bins and hoppers.—**The Branford Co., New Britain, Conn.** 92E



Plug valve

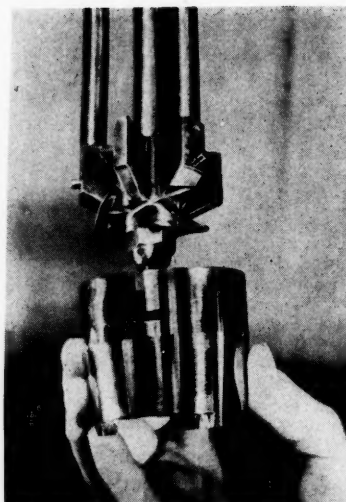
Large unit resembles small valves, is offered in sizes to 12 in.

Teflon-sleeved plug valves are now being made in 8, 10 and 12-in. sizes. The increase in size hasn't changed any of the features available on smaller models, according to the manufacturer.

An addition to a line of similar small valves, the large plugs are gear-operated, have flanged ends, and are rated at 150 psi. and 300 psi. for service from -50 to +400 F.

Designed to handle gases, fluids or corrosive slurries, the units are available in two- and three-way bottom-entry models made of Alloy 20 and Type 316 stainless steel. Carbon steel bodies with stainless steel plugs are also offered. Bronze, Hastelloy, Monel and nickel valves are available.—**Continental Mfg. Co., Cincinnati.** 94A

For more information about any item in this department, circle its code number on the Reader Service Postcard (Page 265).



Convertible mixer

Turbine unit can be used as either an open or closed agitator.

A portable or stationary mixer is available with a separate stator sleeve that permits the unit to be converted quickly from open to closed mixing. The stainless steel unit can handle both low- and very high-viscosity materials.

In open turbine operation, the mixer moves material vertically from top to bottom, and in a circular motion horizontally. Applications typically are for high-viscosity mediums such as thixotropic and gel-like materials.

During closed turbine mixing, material circulates from bottom and sides of the container to the top, forming no vortex and producing a minimum introduction of air. Closed mixing is particularly effective for emulsifying immiscible liquids, reducing agglomeration and wetting out solids.—**Barrington Industries, Inc., Providence, R. I.** 94B

Polyethylene liner

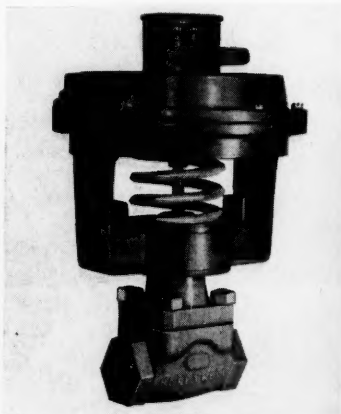
Used in a corrugated carton, the liner provides light weight.

Reduced shipping and storage costs are cited as advantages of a new polyethylene liner designed for use with a corrugated carton.

Said to cost considerably less than metal-liner combinations, the unit performs most of the tasks involving liquids and powders now handled by metal containers.

The liner has a unique spout filler, can be made to conform to various filling nozzles. The spout can be sealed with an inexpensive tool. A similar liner is available with a standard screw-cap closure, also of polyethylene.

While available in stock in 2.5 and 5-gal. sizes, the liners can be fabricated in almost any size in either low- or high-density polyethylene. Vapor-barrier properties make the liner impregnable to moisture and resistant to chemicals, under normal conditions.—**Protective Lining Corp., Brooklyn, N.Y.** 94C



Control valve

Compact unit regulates small flows of gas, water, chemical solutions.

A control valve for regulating flow of gases and liquids on a small scale is available in five models: lightweight and high performance diaphragm units, ultra-low-flow model, and two models having electric actuators.

Using low or line voltage, the actuated models offer two-position floating or proportional control and stroking speeds as low as 7.5 sec. One motor has high thrust for control systems requiring high

New Equipment continues on page 242

Honeywell announces the NEW

series

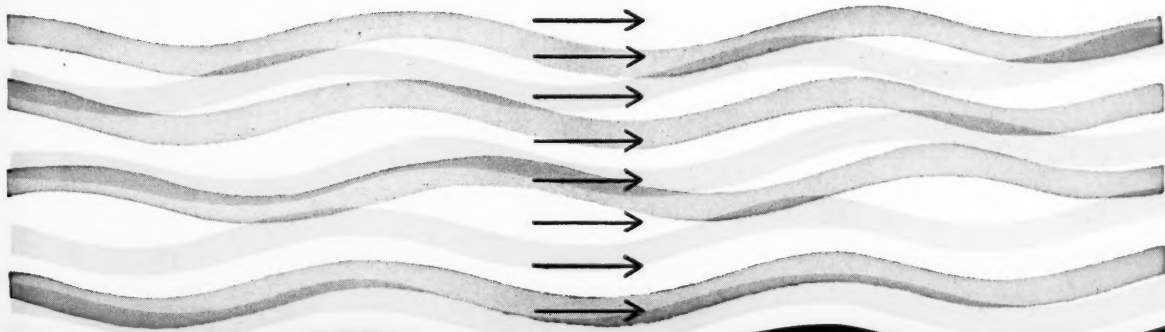
1400

low flow control valve

The addition of the new Series 1400 valve body to the Honeywell line of control valves now gives you a choice of actuator-body combinations to match your applications. Now you can choose the exact type and degree of control you need, without pushing a valve beyond its design limits . . . or without paying for more performance than you need.

The compact Series 1400 valve body is available in a full range of materials, ratings and sizes, with screwed or flanged ends. It can be used to regulate small flows in process, pilot plant, research and commercial control systems. Each body size ($\frac{1}{2}$ ", $\frac{3}{4}$ " and 1") has a wide range of reduced ports with Cv's from .025 to 11.0. Two bonnet constructions facilitate mounting of five types of actuators — three pneumatic and two electric.

Each actuator-body combination fits a different range of operating conditions and performance characteristics, but with sufficient overlapping of these ranges to give you a wider selection on the basis of cost. For complete details, write for Bulletin B803-1. MINNEAPOLIS-HONEYWELL, Fort Washington, Pa.



About \$120.

Model 1401 Low Flow Valve with heavy-duty pneumatic actuator for systems requiring high shut-off ratings and accurate valve positioning.

About \$90.

Model 1403 Low Flow Valve with compact light weight pneumatic actuator for average industrial and commercial control systems.

About \$235.

Model 1404 Low Flow Valve with reduced port Cv's to .025 and top-mounted positioner integral with pneumatic actuator.

About \$155.

Model 1406 Low Flow Valve with Modutrol capacitor-type, electric motor actuator for two-position, floating or proportional control.

About \$210.

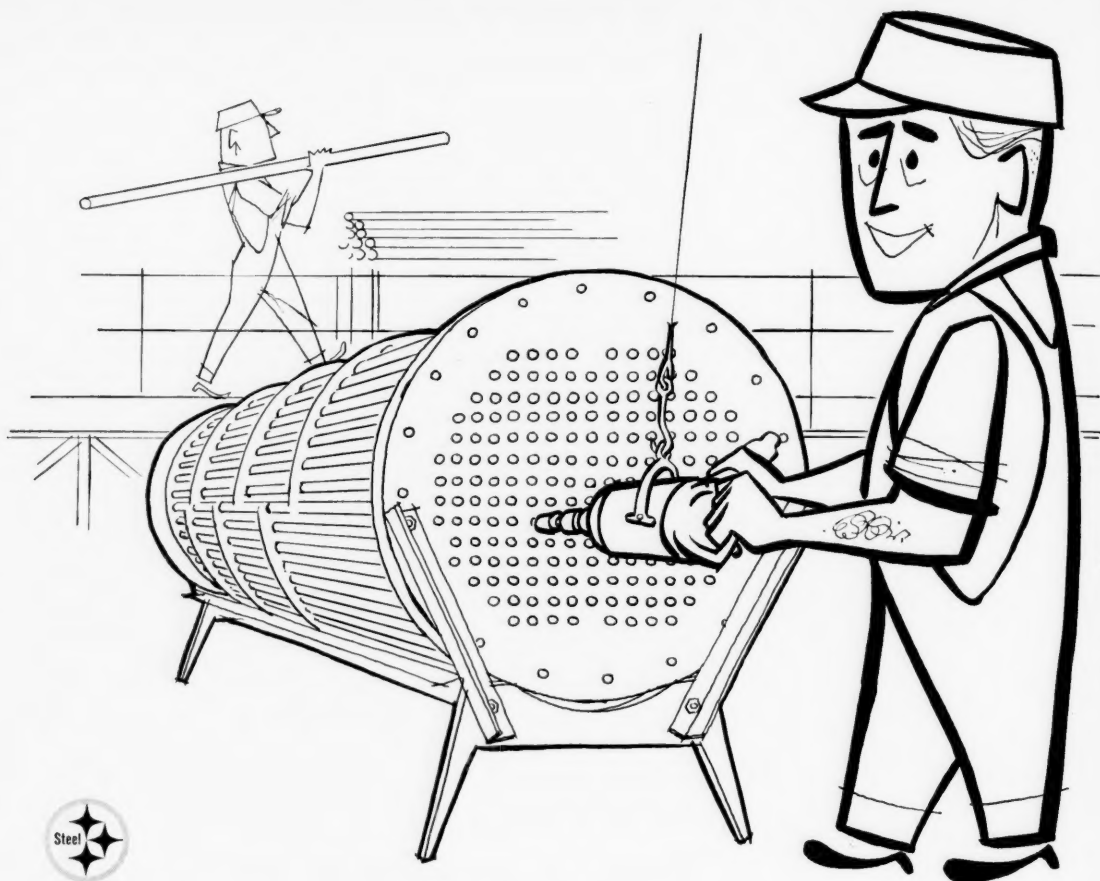
Model 1407 Low Flow Valve with heavy-duty Actionator electric motor actuator provides more power for higher valve shut-off ratings.

Honeywell

H First in Control

HONEYWELL INTERNATIONAL Sales and Service offices in all principal cities of the world. Manufacturing in United States, United Kingdom, Canada, Netherlands, Germany, France, Japan.

CHEMICAL ENGINEERING—September 18, 1961



YOU GET BETTER FIT, EASIER ROLL-IN AT LOWER COST

with **B&W** Lectrosonic Heat Exchanger Tubing

Uniformity of dimensions. Strength of weld. Proper combination of physical and mechanical properties. This is the way B&W produces its Lectrosonic® carbon steel heat exchanger tubing to be sure it fits perfectly and rolls in easily for fast, economical installation.

You save on initial cost, too, because Lectrosonic heat exchanger tubing costs much less than seamless which it has been designed to replace. And there's no sacrifice of quality. B&W's integrated quality control procedures—with 100% ultrasonic testing of the weld in line production—results in a tube equal or superior to seamless. Care to investigate? Just call your local B&W District Sales Office or write for Bulletin TB-431. The Babcock & Wilcox Company, Tubular Products Division, Beaver Falls, Pennsylvania.



B&W

TA-1005-P

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TUBULAR PRODUCTS DIVISION

Seamless and welded tubular products, solid extrusions, seamless welding fittings and forged steel flanges—in carbon, alloy and stainless steels and special metals

CONTINENTAL-EMSCO

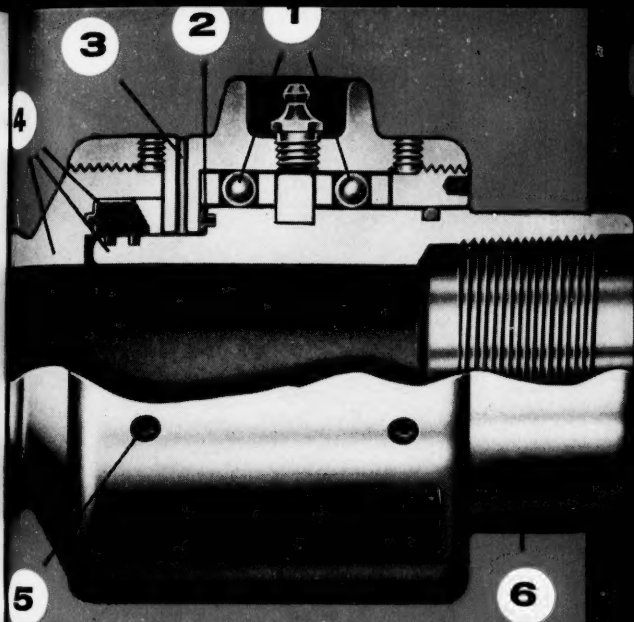
US TYPE SWIVEL JOINTS

*..handle corrosive
chemicals*

*..stop grease contam-
ination of fluids*

*..are repaired on location
with simple tools*

*..can be welded
into the line*



1. Wide Bearing Spacing .. No Split Races
2. Secondary Seal
3. "Weep Hole"
4. Only Wettable Parts and Packing Contact Fluid
5. Simple Set Screws Allow Joint to Break Like a Union .. Bearings and Other Parts Not Disturbed
6. Thread, Weld, Flanged End Connections Available

Continental-Emsco US Type swivel joints are designed *exclusively* for the chemical industry. Fluid contacts metal and packing only, so wettable parts of corrosion resisting stainless steel (or other alloys) can handle all types of caustic products. Primary Teflon packing, *deformed* into grooves for a tight seal, and a secondary asbestos seal prevent grease from contaminating products. Packing chamber design is patented. It reduces bearing wear by preventing packing from pressing against bearings, and allows free swiveling regardless of internal pressure. Joints break like a union without unseating ball bearings and other parts. Joint can be welded into the line,

eliminating costly flanges. Threaded and flanged ends are also available. Wide bearing spacing through use of solid bearing races insures accurate alignment and provides maximum bearing support for internal and external loadings. Races are separate and can be reversed to double their life. Repairs and adjustments are made on the spot, without special tools .. shop or factory equipment not required.

Save installation and maintenance costs by designing, building or replacing with Continental-Emsco swivel joints. There's a size and type to meet all your product handling problems. Let us bid on your next requirement.

**New Swivel Joint Catalog Now
Available .. Write for it Today.**

CONTINENTAL-EMSCO COMPANY • P. O. Box 359 • Dallas 21, Texas

Gentlemen: Please send me your current Swivel Joint Catalog. We are planning:
() New installation () Replacement () Catalog File

NAME _____ TITLE _____

COMPANY _____

CITY _____ ZONE _____ STATE _____

PLEASE PRINT

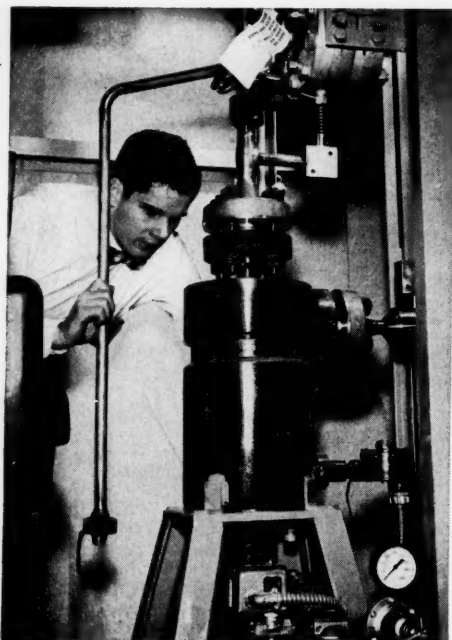
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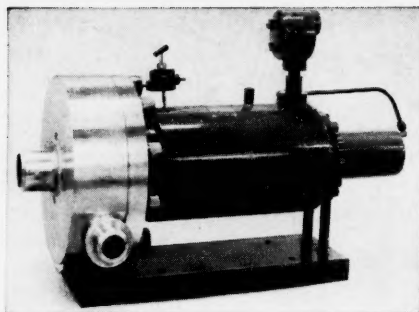
CONTINENTAL-EMSCO
Industrial Products Division
P. O. Box 359, DALLAS 21, TEXAS

A Division of The Youngstown Sheet and Tube Company

1



2



3

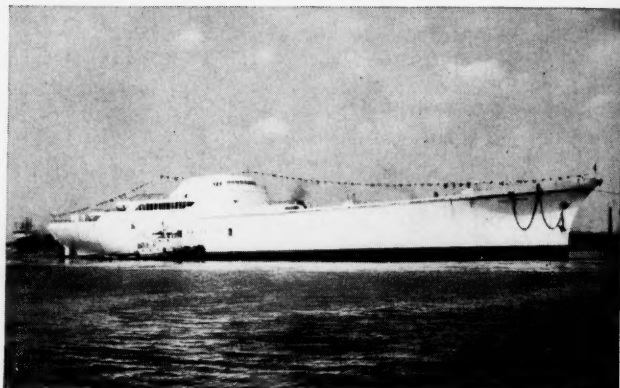
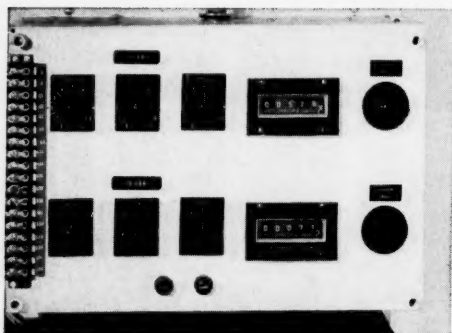


PHOTO COURTESY OF NEW YORK SHIPBUILDING CORPORATION

A PUMP IN SEARCH OF A TOUGH JOB

4



1 At General Electric Co.'s Hanford Atomic Products Operation, this CHEMPUMP performs at 30 gpm, 100' TDH, 700° F, and 3000 psi line pressure. Several others circulate water at 575° F and 1700 psi.

2&3 N.S. SAVANNAH, world's first nuclear merchant ship, uses this CHEMPUMP to circulate primary coolant at 1750 psi, 520° F, 245 gpm and 110' TDH. Other CHEMPUMPS handle radioactive waste with suspended solids and non-condensable.

4 CHEMPUMP developed this automatic controller (illustrated) and leakproof valve operator for use in a 1050° F and 1000 psi helium line. Designed in cooperation with the Darling Valve Company, it contains the helium with zero leakage and provides automatic valve positioning with an accuracy of 0.2%.

Nuclear applications call for pump specifications so tough few pumps can meet them. Not so CHEMPUMP®.

A part of every major nuclear installation in the last ten years, CHEMPUMP is handling tough radioactive fluids like isotope solutions, uranyl nitrate, fluorides, heavy water, bromine trifluoride . . . under performance specifications like these:

LEAKAGE	zero (. . . in or out)
SHAFT SEALS	none
EXTERNAL LUBRICATION	none
PRESSURE	up to 5000 psi
TEMPERATURE	-300 to 1000° F
CAPACITY	up to 1000 gpm
HEAD	up to 625' TDH

And CHEMPUMP's ultimate ability has not yet been approached.

If you're stumped by a tough application, take a good look at CHEMPUMP's special abilities. A glance at the nuclear installations illustrated will give you a sampling of CHEMPUMP's on-the-job capability.

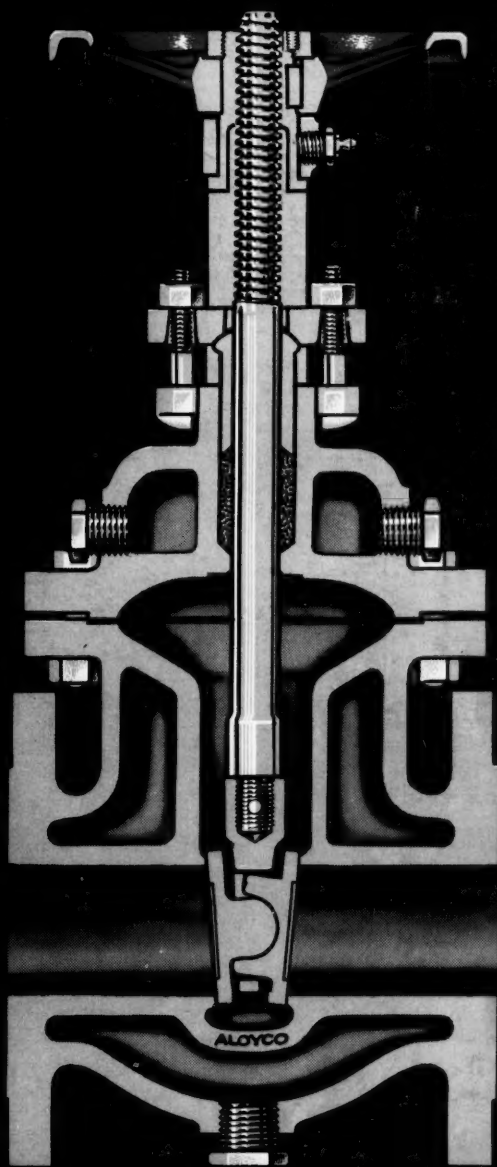
For help in matching CHEMPUMP's abilities to your requirements, write us the details or ask for Bulletin 1070-2. CHEMPUMP DIVISION, FOSTORIA CORPORATION, Buck and County Line Roads, Huntingdon Valley, Pa.



CHEMPUMP

First in the field . . . process proved

Over thirty years'
research devoted
exclusively to...



Aloyco's specialized research... in the field and in the lab... brings you a wealth of metallurgical information for successfully solving your corrosives handling problems.

Coupled with continuing research in design, foundry and machining techniques, this Aloyco specialization results in new and better corrosion-resistant valves for many specific applications. One example above: Aloyco completely jacketed valves (the first ever to be integrally cast in high alloys) are designed for viscous liquids and other fluids difficult to move at high temperatures.

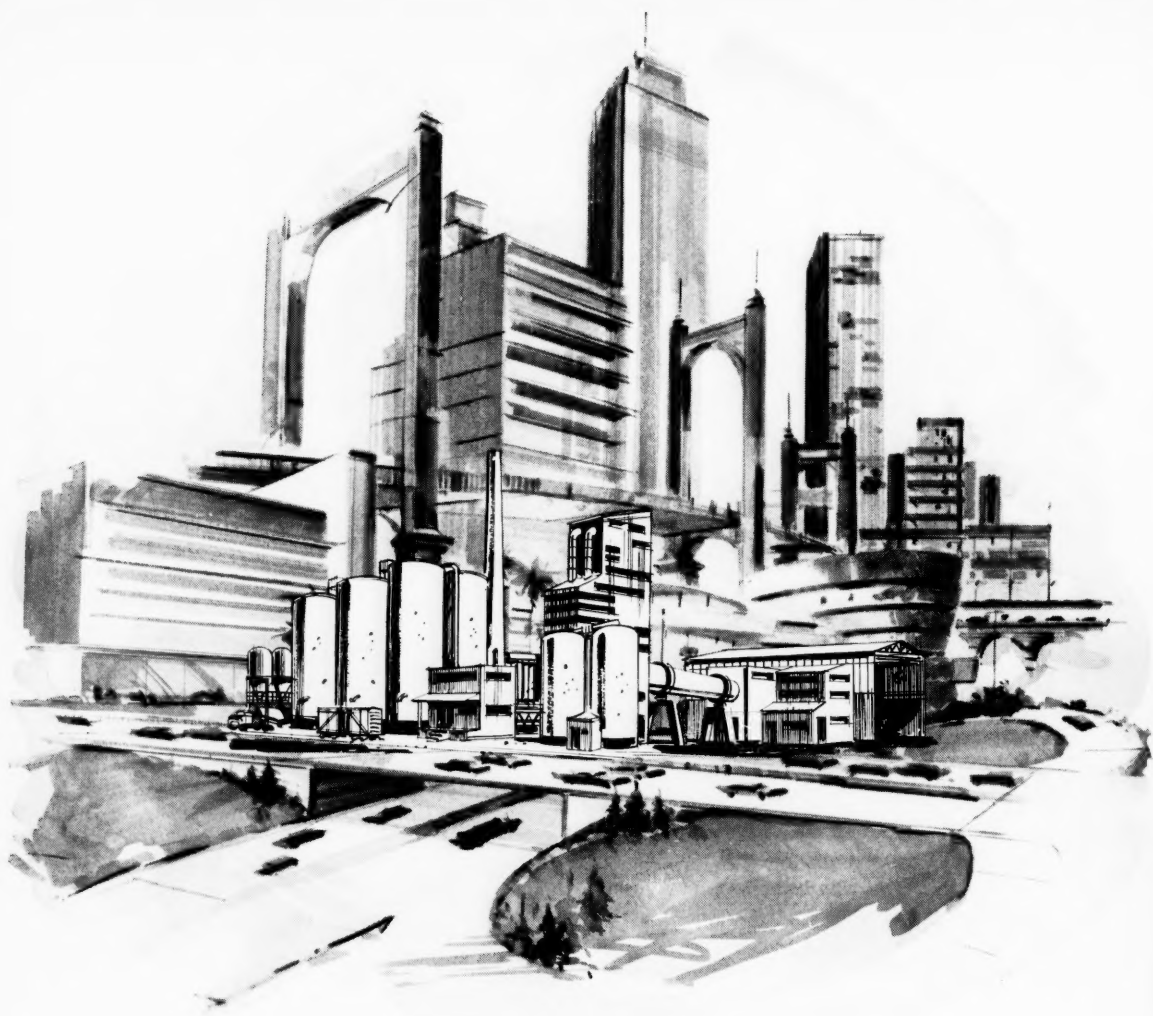
Set your surest source of supply the one company with research, manufacturing and sales devoted to Stainless Steel Valves exclusively?



ALLOY STEEL PRODUCTS COMPANY
SUBSIDIARY OF WALWORTH COMPANY

Boston • Wilmington • Atlanta • Birmingham • Baton Rouge • Buffalo • Pittsburgh • Chicago • St. Louis • San Francisco • Los Angeles • Seattle





Feeding the roots of progress in the cement industry

Cement—the matrix of world construction—is in the USA a 1.3 billion dollar industry. Continuing technological advances keep this basic industry efficient, competitive and responsive to changing requirements in building and construction. Fuller Company, whose pneumatic materials handling and process equipment figures in a wide range of industries, plays an important role here.

In more than 35 years of growing with the industry, Fuller has pioneered

manufacturing innovations now standard in the field . . . techniques and equipment that have influenced vast improvements in the design of entire cement-producing plants. In these years Fuller has built an *integrated* organization—Dracco Division, Traylor Engineering & Manufacturing Division, Sutorbilt Corporation and Lehigh Fan and Blower Division. They are combined to provide the cement industry everywhere with advanced research, with the design and manufacture of equipment

for crushing, grinding, preheating, burning, cooling, blending, heat transfer, conveying, dust collection and process control. Fuller is now able to undertake contracts for complete new plants for cement manufacturing and for the modernization of older ones.

Fuller is more than ever qualified today to help cement producers keep cement competitive in prices and quality with existing alternate materials and those to come. For more details on Fuller's capabilities, write today.

See *Chemical Engineering Catalog* for details and specifications.

Fuller

FULLER COMPANY • 134 BRIDGE ST. • CATASAUQUA, PA.

SUBSIDIARY OF GENERAL AMERICAN TRANSPORTATION CORPORATION • OFFICES IN PRINCIPAL CITIES

FULLER DIVISIONS

Dracco • Lehigh Fan & Blower • Traylor Engineering & Manufacturing • Sutorbilt Corporation



2880
G-245



PHENOL USP (SYNTHETIC) Only Plastics Division can supply you with every grade of Phenol... both synthetic and natural. Our synthetic Phenol... made to very exacting specifications... is right for all applications. In fact, it is one of the few Phenols pure enough for use in the production of Nylon 6! And when you order Plastics Division Phenol, you get more than a top-quality product. You get the absolute assurance of a regular supply... one that will satisfy your requirements throughout the years. Next day delivery in the East and Midwest can be depended on, too, for we now have storage facilities in Toledo, Ohio, as well as at our Philadelphia plant. Look to the natural Phenols to save you money—particularly in resins, lube oil extraction, and alkyl phenols. A highly versatile chemical, Phenol, is valuable in the manufacture of nylon and epoxy resins, medicinals, dyes, photographic developers, plasticizers, wood preservatives, weed killers, insecticides, and anti-oxidants.



TAR ACIDS Our standardization methods insure regular shipments of the highest quality tar acids. We not only can give you the blend you need, but will be happy to help you solve any tar acid problems.

Phenols Synthetic & Natural Technical Phenol (all grades) Phenol-Cresol Mixes Phenol-Cresylic Mixes	Cresylic Acids Specially blended mixtures of close-cut fractions Special Engine Cleaning Grades
Cresols Cresol, USP Ortho Cresol (from 50% to 98+% purity) Meta/Para Cresol Resins Cresols Special Cresol Fractions blended to order	Xylenols Metaxyleneol—45°C., 56°C., and 61.2°C. Min. M.P. Crude and Refined Grades Special Fractions



A-C® POLYETHYLENE Combine these unusual characteristics—high melting point, low melt viscosity, resistance to water and to most chemicals (at room temperature), compatibility with waxes and wax-like materials—and you get A-C Polyethylene, the coating that is exactly right for so many varied applications. **For paperboard coatings:** improves gloss and gloss retention, adds resistance to blocking and abrasion and to chemicals, increases tensile strength, frequently cuts down on wax consumption. **For fabrics:** treatment with an A-C Polyethylene emulsion improves tear strength, abrasion resistance, crease recovery and resistance to needle cutting. **For blending:** can be used in polishes, candles, electrical insulations, rubber, and in many different operations. And new uses continue to be discovered every day. Looking for a chemically inert coating? One that is both tasteless and stable in the presence of organic liquids? A-C Polyethylene may solve your problems. Call us at any time for technical assistance.

ELASTEX® PLASTICIZERS Each of Allied Chemical's plasticizers has special properties that can improve a variety of products. "Elastex" 90-P Plasticizer is a good example. It offers electrical insulation performance substantially equivalent to that of high quality DOP, plus superior retention of elongation after severe heat-aging. It is recommended for use in vinyl compounds for high temperature wire insulation. Why not look into the whole family of Elastex Plasticizers? Most likely one or another of them can improve the product you manufacture.

Dibutyl Phthalate*
Dimethyl Phthalate*
DCHP Plasticizer — Dicyclohexyl Phthalate
10-P Plasticizer* — (Diisooctyl Phthalate) (DIOP)
28-P Plasticizer* — Di-2-Ethylhexyl Phthalate (DOP)
18-P Plasticizer* — Isooctyl Isodecyl Phthalate
20-A Plasticizer* — Diisodecyl Adipate
40-P Plasticizer* — Butyl Isodecyl Phthalate
48-P Plasticizer* — Butyl Octyl Phthalate
50-B Plasticizer* — Butyl Cyclohexyl Phthalate
60-A Plasticizer* — Di-2-Ethylhexyl Adipate
82-A Plasticizer — Normal Octyl—Normal Decyl Adipate
82-P Plasticizer* — Normal Octyl—Normal Decyl Phthalate
90-P Plasticizer* — Diisodecyl Phthalate
36-R Plasticizer — Medium molecular weight polymeric plasticizer
Plasticizer 136* — An aryl Alkyl hydrocarbon

*Available in Tank Cars or Trucks

ACETONE When used in cellulose acetate and epoxy resins, acetone must be especially free from contaminants. That's why Plastics Division's super-pure acetone is preferred for these applications—and for use as a solvent, in many chemical extractions and syntheses, and as an intermediate in chemical and drug manufacture. Fast delivery by tank car from Philadelphia, or by tank truck from our supply depots in Boston, Buffalo, Chicago, Cleveland, Detroit, Indianapolis, Los Angeles, New York, Philadelphia, and St. Louis. Drum stocks at all of these points and at Charlotte, N. C.

INDUSTRIAL AROMATIC SOLVENTS

You can count on a stable supply of aromatic solvents from Allied Chemical—and they'll be of the highest reliability, too. For Allied played a pioneering role in standardizing testing methods and specifications for light oil distillates. If your plant is within 100 miles of one of our ten nation-wide tank wagon stations, you get prompt delivery by our own tank trucks. And from most of our stations, you can order acetones, glycols, and phthalate plasticizers for combination delivery with our aromatic solvents.

Benzol, Nitration	Xylol, Nitration
Benzol, Industrial Pure	Xylol, Ten Degree
Benzol, Industrial 90%	Xylol, Industrial
Benzene, Thiophene-free	Hi-Flash Solvent
Toluol, Nitration	1320 Oil
Toluol, Industrial Pure	Wire Enamel Solvent

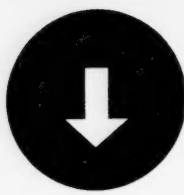
Also available in Tank Cars





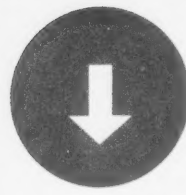
PHTHALIC ANHYDRIDE

Low cost, ease of handling, versatility...these, along with the outstanding chemical and physical properties it imparts, are reasons behind the growing demand for phthalic anhydride. Now the laboratories of Allied Chemical add another: exceptional purity. The result? Significant improvement in quality for alkyd and polyester resins, plasticizers, fine chemical syntheses and dyes, pharmaceuticals, and many other products. Our conveniently located plants and warehouses assure fast, dependable delivery of phthalic anhydride in liquid and flake form. Technical assistance upon request.



NIACIN In pharmaceuticals, in animal and poultry feeds, in the enrichment of flour, Niacin plays an important role. Naturally these applications demand the highest purity—and Plastics Division Niacin satisfies that demand. It meets the highest USP standards of purity and is recommended for use in the blending of vitamin premixes. All grades, including feed grain Niacin of 50% to 80% purity, are available from our manufacturing plant in Philadelphia and our warehouses in Los Angeles and Chicago.

TAR BASES Possibilities for these versatile chemicals seem almost limitless. Already tar bases have found important application in such diverse fields as water repellents, antihistamines, and stabilizers for chlorinated solvents. So that you can explore their use in your industry, Plastics Division will be glad to send you samples and technical data.



OTHER CHEMICALS AND PRODUCTS

ACETOPHENONE
ADIPIC ACID
CUMENE
CUMYLPHENOL
CYCLOHEXANOL
CYCLOHEXANONE
DIETHYLENE GLYCOL
ETHYLBENZENE
ETHYL GLYCOL
FLOTATION AGENTS
FUMARIC ACID
MALEIC ANHYDRIDE

(continued below)

ALPHA-METHYLSTYRENE

A low cost unsaturated aromatic monomer, our alpha-methylstyrene is produced by a cumene-phenol operation and is highly pure (99.5+%). It is used in styrenated alkyd resins...high-heat distortion polystyrene...polyesters...the manufacture of cumylphenol...ion exchange resins...and polymeric plasticizers. Alpha-methylstyrene also co-polymerizes with a wide variety of unsaturated compounds, including butadiene, terpenes, acrylates, methacrylates and most vinyl monomers.

ANTHRACENE Recent studies have revealed new and important information about anthracene reactions. Did you know that Diels-Alder adducts are potentially useful as intermediates for plasticizers, adhesives, tanning agents, synthetic dyestuffs, and synthetic beater sizes for paper? Or that Friedel-Crafts reactions with olefins provide resins and pour-point depressors for lubricating oils? Well, these are just a few of the many anthracene reactions that lead to commercially valuable products. Also, anthracene is photoconductive and reacts photochemically. (And our anthracene is 90-95% pure.)

CUMAR® RESIN

Because "Cumar" Resin ranks first in its field for purity and quality, it is well worth the little extra it costs. A versatile thermoplastic resin, it is available in nine separate grades. Most frequent applications: floor tile, aluminum paint, rubber products (both natural and synthetic), waterproofing materials and adhesives.

METHANOL

PICKLING INHIBITORS
RESIN S (A natural synthetic resin of high styrene content)

RUBBER COMPOUNDING MATERIALS

TAR ACID-OILS

TAR DISTILLATES

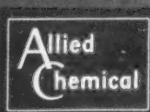


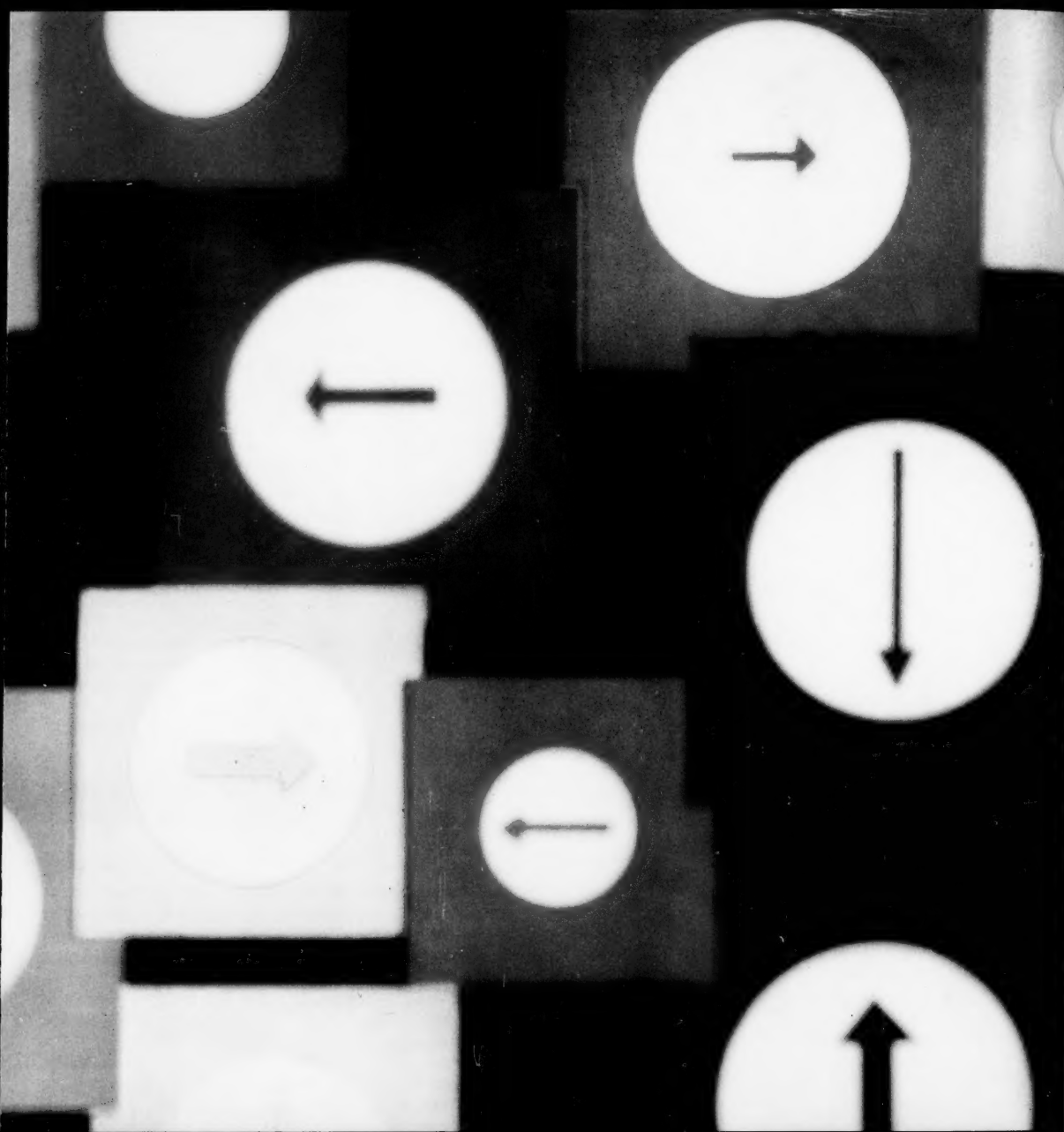




NEW DIRECTIONS FOR THE CHEMICAL INDUSTRY

Coal-tar derivatives that lead the way to new, or improved, products... and profits. This folder includes coal-tar chemicals and petrochemicals... some are commercially new, others long established. All are unsurpassed for purity, uniformity and quality. Look them over carefully. They can help you discover new and economical solutions to a variety of production problems.





EXPRESS TANK TRUCK DELIVERIES OF PLASTICIZERS

Efficient handling and shipping in modern stainless-steel tank trucks assure prompt delivery of all the pure, uncontaminated Plasticizers you need. For express tank truck deliveries, call the Plastics Division office nearest your plant:

Boston Davenport 2-7460
 Buffalo TR 3-3600
 Chicago Michigan 2-1800
 Cleveland HEnderson 2-2020
 Detroit Vinewood 2-2500
 Houston Walnut 3-2871

Indianapolis Clifford 5-5443
 Los Angeles Nevada 6-2306
 New York HAnover 2-7300
 Newark Mitchell 2-0960
 Philadelphia JEfferson 3-3000
 St Louis PLainview 6-3404

FOR THE LATEST INFORMATION ON COAL-TAR CHEMICALS, WRITE US, AND WE WILL SEND YOU HELPFUL PRODUCT DATA ESPECIALLY COMPILED FOR YOUR INDUSTRY. IF YOU WOULD LIKE EXTRA COPIES OF THIS FOLDER, ASK FOR FORM P.D. 350.



BASIC TO AMERICA'S PROGRESS
PLASTICS DIVISION

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CHEM

HOKE Flow Sheet ⁷

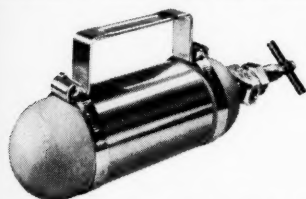
HOKE REPORTS ON FLUID CONTROL

PRESSURE BY THE POUND...no matter how thin you slice it!

Do You Have A Bomb In Your Lab?

In the process industry, sampling cylinders are occasionally referred to as bombs. In recent months, this misnomer has been, unhappily, pretty close to the truth. Some military surplus, low carbon steel, two-piece cylinders have found their way into industry and have been used beyond their rather limited capabilities. Unfortunately, several serious accidents have spotlighted this use as a very real safety problem.

Since sampling is such a serious business, we have perfected, for maximum safety, a seamless, one-piece cylinder. This unabashed declaration of excellence has sound

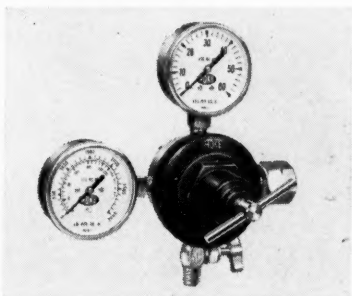


basis in fact — the entire cylinder is formed from a single piece of seamless type 304 stainless steel tube. To quell the qualms of process men, sample contamination is practically nonexistent, and the cylinder resists destruction from most corrosives.

As a further safety guarantee, all standard sampling cylinders are fabricated to meet ICC and other safety regulations. Standard cylinders are available at pressures to 1800 psi (10 ml. to 1 gallon), but higher pressure cylinders can be had on special order.

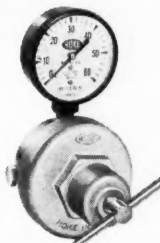
If you'd like additional information on Hoke cylinders, plus a detailed paper on the various methods of collecting samples from process lines, drop us a line. We'll also include details on special cylinder valves, outage tubes and other cylinder accessories.

One trouble with doing something better is that it's hard to stop. This time, we've come up with a new line of pressure regulators. We made them for the technically oriented who have developed high standards and for the penurious purchaser who wants something for (almost) nothing.



One, tagged as the 680 Series, is a highly stable single stage regulator with something for just about everyone. The core of this regulator is its control accuracy of 2% at flows to 2000 SCFH. Two models are available. One delivers 0 to 40 psi and the other 0 to 140 psi and both can handle inlet pressures up to 3000 psi. Use them on any gas compatible with 2024-T4 aluminum alloy, neoprene, polyurethane and Buna-N.

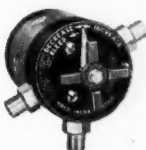
If what we've said sounds good so far, but still won't solve your problems, read on.



can be had by marking an "X" below.

We've built a regulator specially for corrosive gases and atmospheres. Available in either all monel or all stainless steel construction, we call it the 640 Series. Spec sheets on this

If you "X" the next box, you'll get a package of useful information on a special regulator that will handle delivery pressures up to 4500 psi with very high control accuracy. This is a 2 stage spring and dome loaded regulator and we claim that a 50% change in inlet pressure will not change the delivery pressure more than 2%. Operation is simplicity itself. For no particular reason, we call this the 920 Series.



Skeptics should send for all of this information.

'61 PRODUCT PARADE

You'd be surprised at some of the screwball ways our valves have been used (to decided advantage, of course). Hoke distributors are armed to their maxillary third molars with this method madness and will redesign your systems with new Hoke products at the drop of a postcard. Check the PRODUCT PARADE Box.

Hoke's Performance Guarantee—Every Valve Leak-Tested!

HOKE INCORPORATED

39 Piermont Road, Cresskill, N. J.

Send me complete information on the Hoke products checked below:

- ☐ 680 Series Regulator
- ☐ 640 Series Regulator
- ☐ 920 Series Regulator
- ☐ '61 Product Parade
- ☐ Sampling Cylinders
- ☐ Complete Catalog GC561

NAME _____ TITLE _____
COMPANY _____
ADDRESS _____
CITY _____ STATE _____

SEE OUR CATALOG IN SWEETS PRODUCT DESIGN FILE



This is
AMERICAN OIL
COMPANY
in action



Fourteen years ago Morton Salt stopped worrying about hydraulic oil performance

Harlen Bufka, assistant mill foreman (center) and American Oil's Norm Pagels, review specifications of AMERICAN Industrial Oil. Oil has been used for 14 years in hydraulic press that forms salt blocks under 800-850 tons pressure.



by N. M. PAGELS About the Author

For 17 years "Norm" Pagels has been providing industrial customers with technical assistance on lubrication problems. His qualifications for this assignment include a degree in chemistry from the Central Michigan University and the completion of his company's Sales Engineering School.

☆ ☆ ☆

Back in 1946, Morton Salt Company installed a 1,000 ton press for forming salt blocks in their Manistee, Michigan, plant. They ran the press briefly with a break-in oil as the hydraulic medium. In 1947, they added our industrial oil to the reservoir. Worries stopped then.

There has never been a complete oil change. Only make-up oil has been added to the reservoir since the initial fill. There has never been any hydraulic pump trouble or a failure of any kind due to the oil. Annually, we take a sample of the oil for analysis by our Technical Service laboratory (at our expense). The oil continues in excellent condition. Morton Salt plant management reports that it (1) holds viscosity (2) resists oxidation (3) lubricates effectively, minimizing wear (4) exhibits excellent demulsibility and (5) is notably resistant to foaming.

☆ ☆ ☆

Would you like to have the trouble-free performance from an oil that AMERICAN® Industrial Oil provides? Call your nearby American Oil office.

Quick facts about

AMERICAN® Industrial Oil

- Antioxidant gives oil resistance to chemical change, minimizes deposits.
- Inhibitor "plates out" on metal surfaces, prevents corrosion.
- Receives special refining to minimize emulsion problems. Contains additive to minimize foaming.
- High viscosity index. Resists temperature change.

**AMERICAN
OIL
COMPANY**



910 SOUTH MICHIGAN AVENUE
CHICAGO 80, ILLINOIS

CHEMICAL

NEW FEEDWATER HEATER TUBE

**provides high strength
... at lower cost**

ANACONDA CUPRO NICKEL, 30%-707 provides important money-saving advantages over generally used feedwater heater tube alloys. Approved for condenser and heat exchanger use by the ASME Boiler & Pressure Vessel Code Committee, it offers highly desirable properties for power plant feedwater heaters ... at lower initial cost.

A point-by-point comparison of mechanical properties is detailed in our Publication B-45.

Of course, this high-strength copper-nickel-iron tube alloy is only one of the many Anaconda alloys available for various types of heat exchangers. These include arsenical admiralty, red brass, 10% and 30% cupro nickels, phosphorized coppers, and Anaconda's own Ambra-loys, Ambronze, and Everdur®.

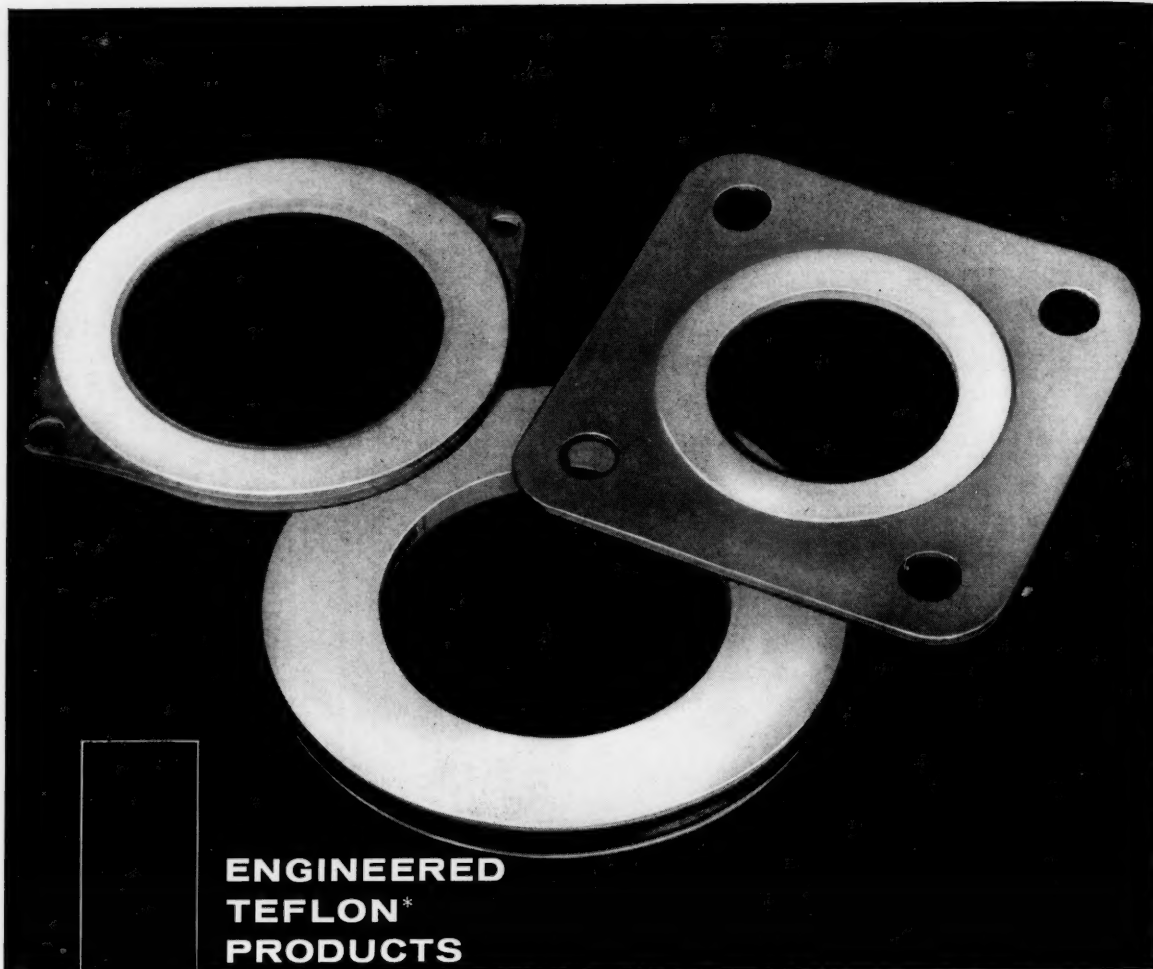
For the complete story, ask your nearest Anaconda technical representative, or send for our 44-page Publication B-2 and Cupro Nickel, 30%-707 Publication B-45. Address: Anaconda American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

61-920

CUPRO NICKEL, 30%-707

**Weldable
High Strength
Corrosion Resistant
Stress-corrosion Resistant**

ANACONDA
AMERICAN BRASS COMPANY



ENGINEERED TEFLON* PRODUCTS

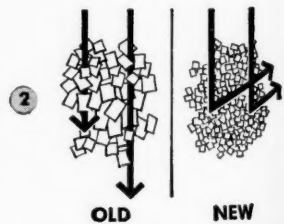


for
Chemical
Processing

New, improved Garlock Teflon-Jacketed Gaskets offer distinct advantages on glass-lined equipment. Two new design innovations have been added to the formed-shield type of gasket: (1) ends are now butt-welded instead of overlapped, resulting in a face of uniform thickness and elimination of "lump" at the seam; (2) a new, high-quality grade of Teflon is used, resulting in less permeability and chance of mechanical failure.

For positive sealing to withstand—but not contaminate—reactive blends, batches and mixtures, apply Garlock Teflon-Jacketed Gaskets. Wide variations of styles, filler materials, and sizes can be furnished to suit practically all process equipment including glass-lined piping, flanges and fittings. Call your local Garlock representative at the nearest of the 26 Garlock sales offices and warehouses throughout the U. S. and Canada. Or, write for Catalog AD-154. Garlock Inc., Palmyra, N. Y. **Canadian Div.:** Garlock of Canada Ltd. **Plastics Div.:** United States Gasket Co. **Order from the Garlock 2,000 . . .** two thousand different styles of Packings, Gaskets, Seals, Molded and Extruded Rubber, Plastic Products.

*DuPont Trademark



GARLOCK

This in
Division
Bartow
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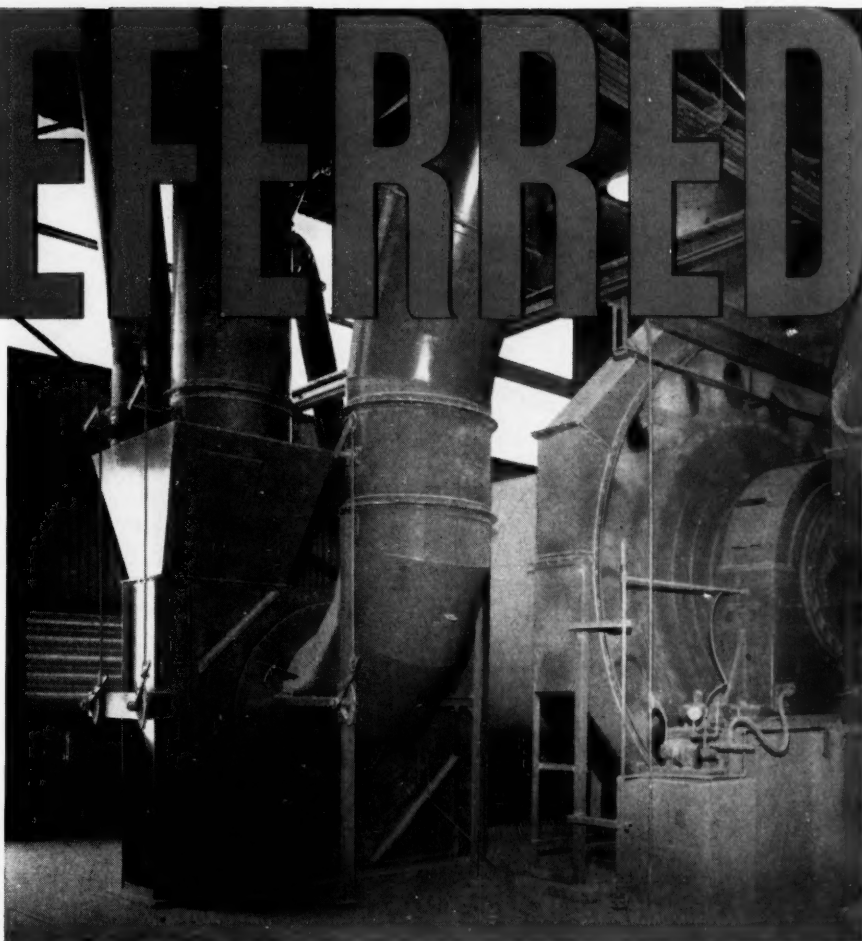
■ can
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Primary
• Scrub

CHEMI

PREFERRED

This installation of the Davison Chemical Division, W. R. Grace & Company at Bartow, Florida, typifies industry's preference for Kennedy.



KENNEDY

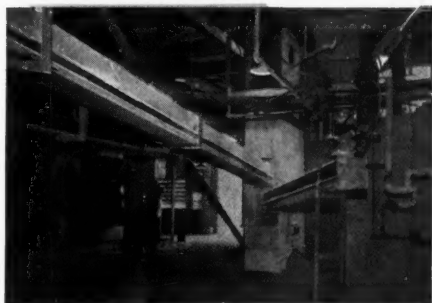
air swept grinding systems boost phosphate tonnage

The Phosphate Industry has experienced a tremendous growth in capacity over the past few years. It is significant that a majority of these installations have included Kennedy Air Swept Grinding Systems and Kennedy Air-Float Conveyors.

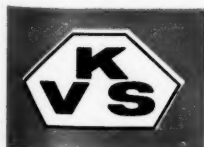
why KENNEDY is preferred...

The Kennedy Air Swept Grinding System is the *ONLY* system for grinding Florida Phosphate Rock to measure continuous operation in *YEARS* rather than months, because...

- cannot be jammed or damaged by tramp iron or other foreign material
- no periodic shutdowns for wearing part replacement
- careful basic design and positive lubrication above and beneath trunnions assure high mechanical efficiency.



Phosphate is but one of hundreds of dry materials which are conveyed cleanly, conveniently and economically by Kennedy Air-Float—the preferred air-gravity conveyor.

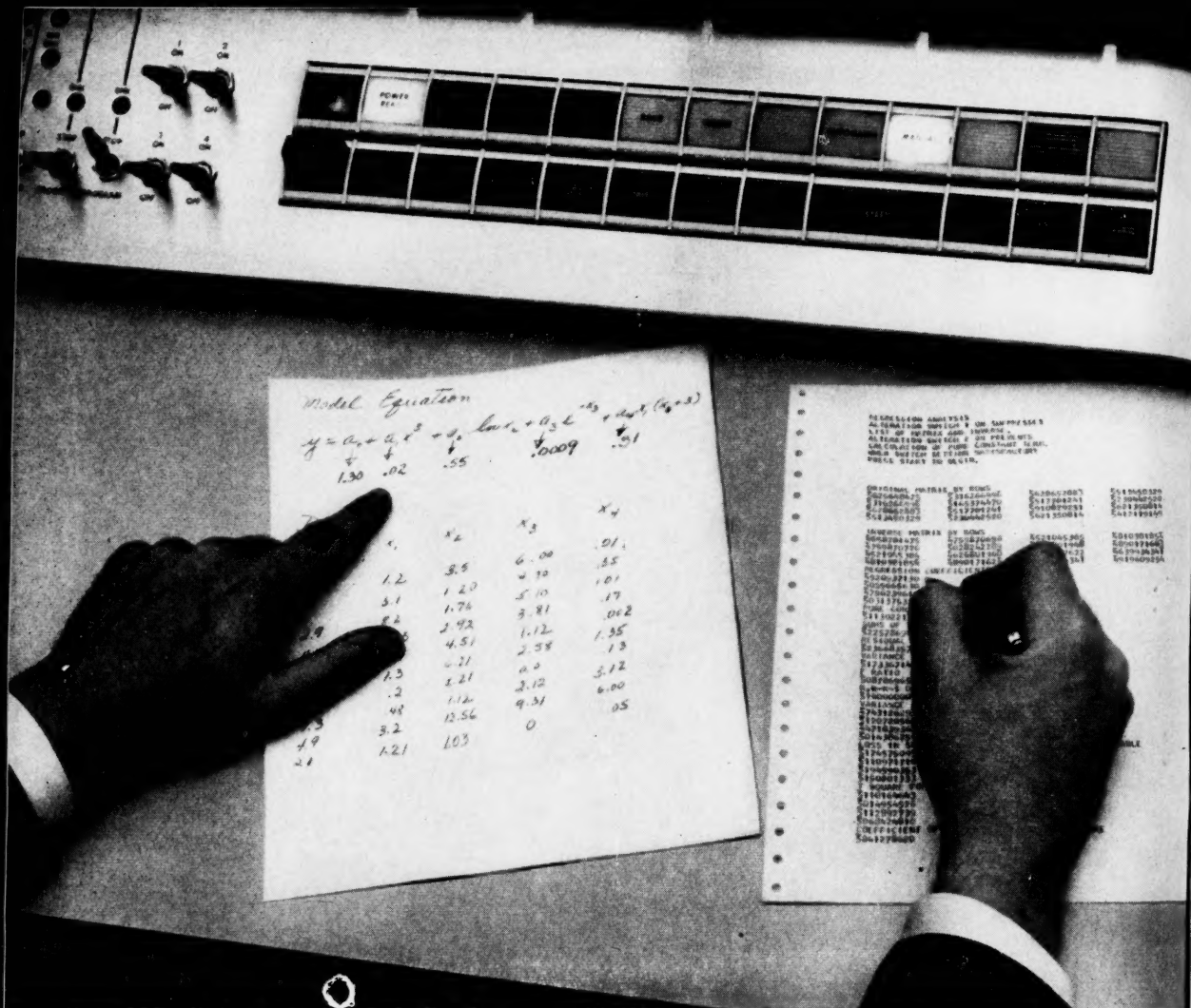


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Want to find the coefficients? It's easy with the new Regression Analysis program for the IBM 1620

Here's another program offered free-of-charge to users of the IBM 1620 Data Processing System. It gives you the kind of results you might expect only from a much more expensive computer. But users of the 1620 know that its low rental cost is deceptive. The 1620 packs *more computing power per cubic inch* than any other computer in its size range.

The Regression Analysis program is a good example. Suppose you want a fit for production purposes. If you employ more than two variables you probably have difficulty visualizing the representation of your data. If linearity is not the case, you must often guess blindly at a polynomial of high degree, accept or reject the fit with some-

thing approaching a sixth sense, and either try again or settle for the results you have.

The new Regression Analysis program lets you handle expressions containing up to 24 variables. If you have the even more complicated task of handling many dependent variables, the program will generate regression coefficients with a maximum number of dependent variables not exceeding one-half the number of independent variables.

This program will also fit non-linear functions and hyper-surfaces. Compare this performance with that of any other computer in the 1620's price range.

A basic 1620 installation rents for just \$1600 per month. For details, contact your local IBM Representative.



IBM's 1620 is a compact desk-size computer.

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DISTILLATION EQUIPMENT

For over 30 years, Struthers Wells has been a leading supplier of equipment to the chemical, petroleum and other process industries. A large number of fractionating columns and distillation units have been built for specific service requirements. Other items of equipment to make up complete distillation units are available in standard designs, including heat exchangers, stills, fired heating equipment, vessels and structural steel.

Struthers Wells builds columns or other single equipment items and can supply all of the necessary equipment to make up a complete unit, including piping, pumps and instruments. Complete working drawings and process flowsheet can be furnished if desired.

An opportunity to survey your requirements for new equipment will be welcomed.



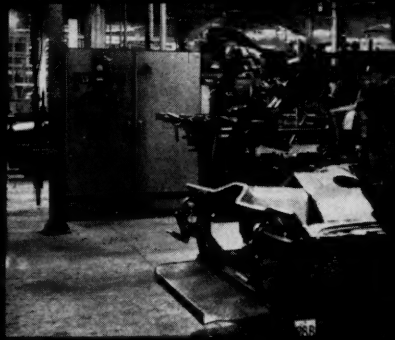
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STRUTHERS WELLS CORPORATION

WARREN, PA. plants in Titusville and Warren, Pa.

Our new
Bulletin A-70
describes
this equipment.
Write for
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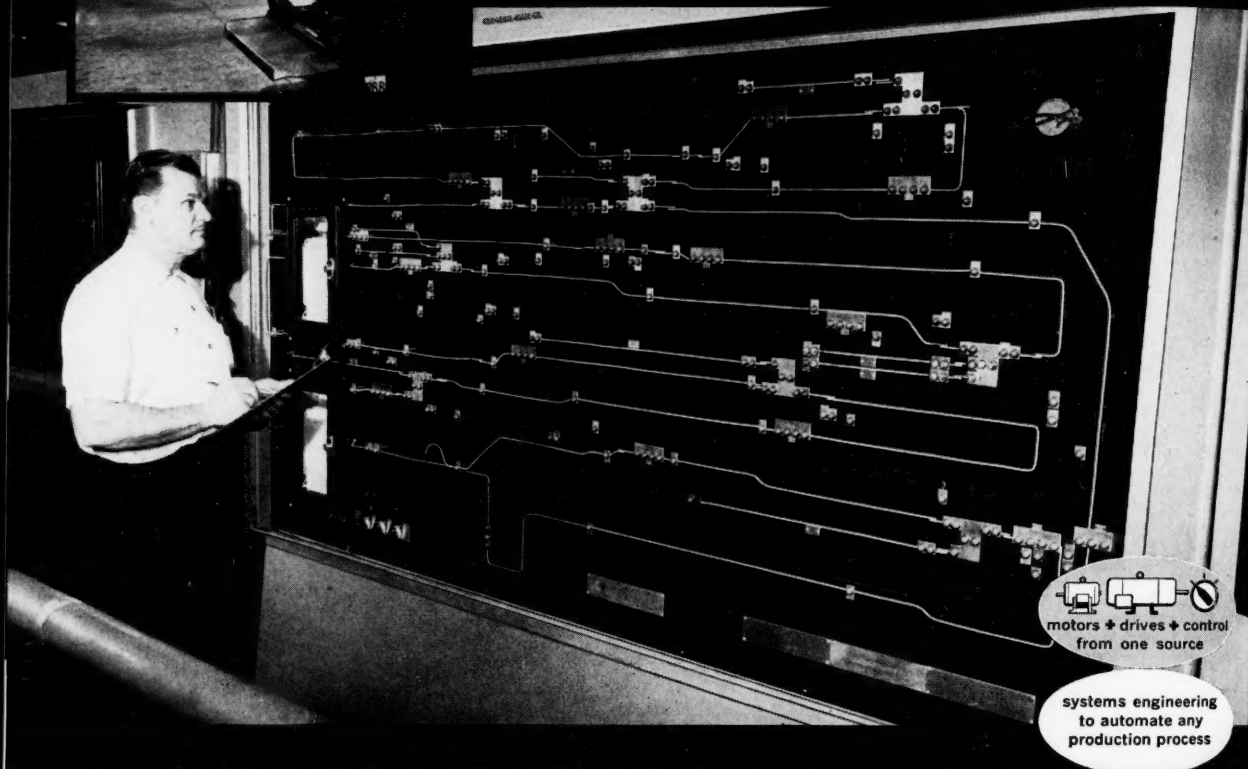
FROM INITIAL BODY ASSEMBLY—Louis Allis controllers coordinate the intricate assembly of side gate framing fixtures and underbody just prior to welding by synchronizing the arrival of three components from three different locations at precisely the same time . . .



TO PRE-FINAL ASSEMBLY AREA—where a bank of Louis Allis controllers regulate the drives powering the mating line where unitized body, stub-frame / engine assembly and running gear are assembled into units like the Plymouth convertible shown coming off the assembly line . . .



AND 3-DIMENSIONAL AREA CONTROL CENTER—which monitors conveyor operations. Any type of production interruption is quickly revealed and identified by signal light indication. Recorders provide a permanent daily record of each conveyor's operation.



LOUIS ALLIS engineered systems automate Chrysler assembly lines



An automobile assembly line is a materials handling complex of movement and synchronization. Feeder lines joining the main-line must deliver components on time—and in perfect synchronism. Still, the system must be flexible enough to accommodate speed changes when desired.

The Plymouth assembly plants in Detroit and St. Louis are models of this type of automation . . . and electrical components for the materials handling systems were custom-engineered by Louis Allis. L. A. systems engineers worked with Plymouth engineers to map the flow sequence. Louis Allis provided the adjustable speed drives and precision controls to operate the systems and supervised the installation. The result: integrated, automated systems that

eliminate time loss, manpower waste, and excess materials handling costs.

Synchronized conveyors operate at pre-set speeds by following built-in master job-rate controllers. The system provides for automatic, position-perfect transfer of body components from one conveyor to another. A three-dimensional area control center monitors and records all conveyor operations.

If your plans call for automation, contact Louis Allis for systems engineering assistance—and single-source responsibility of drive and control design, manufacturing, and service. Call the Louis Allis District Office nearest you, or write to The Louis Allis Co., 447 East Stewart Street, Milwaukee 1, Wisconsin. Ask for Bulletin 2900.

LOUIS ALLIS

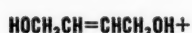


increased demand for this unique intermediate permits a further reduction in price

BUTENEDIOL is a unique and versatile olefinic glycol. The *cis*-configuration and highly reactive double bond make it a key intermediate in the manufacture of many products, such as agricultural chemicals, polymers (including polyurethanes and epoxies), pharmaceuticals...

TYPICAL REACTIONS

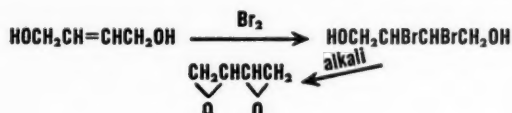
1. Diels-Alder



2. Epoxidation



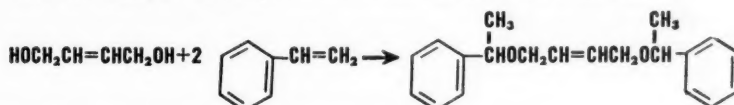
3. Butadiene Dioxide



4. Ester formation



5. Ether formation



Other interesting and useful intermediates
available in laboratory quantities:

1,2,4-butanetriol
butynediol diacetate

2,3-dibromo-2-butene-1,4-diol
1,4-dichloro-2-butyne

For new data bulletin on BUTENEDIOL and/or for further information, price schedules and samples of any of these versatile intermediates, write to: Dept. A-27



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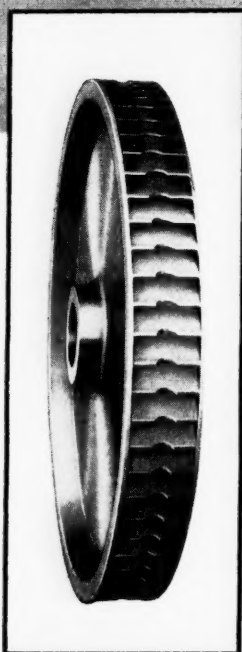
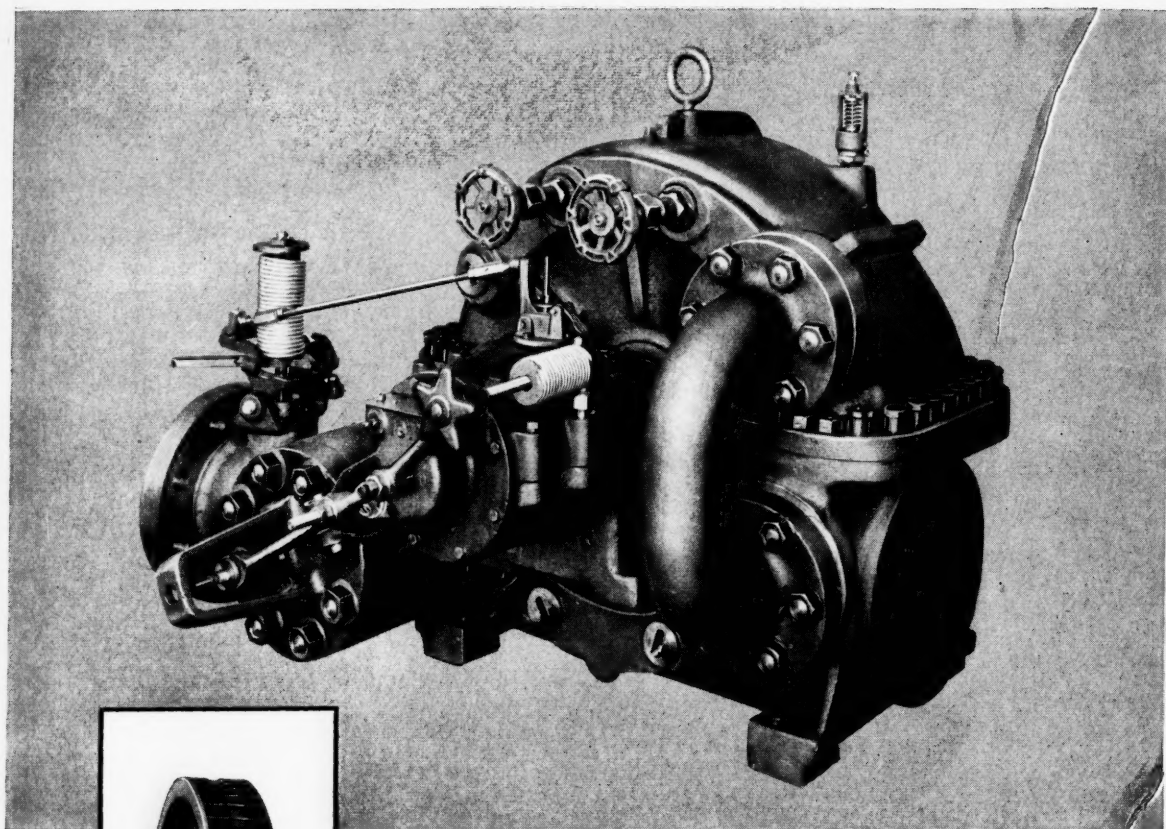
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A DIVISION OF

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solid-wheel turbine means performance instead of worry

In these days of automated production, proven reliability has come to be highly prized in a machine. That fact helps to explain the popularity of the Terry solid wheel. For here is a turbine designed from the start to be solid and simple . . . require minimum maintenance.

The wheel is a single steel forging. Unlike a built-up rotor there are no separate parts to loosen or work out. Since the effective steam action is at the backs of the buckets, wear does not affect efficiency.

Blades are notched in the centers to prevent destructive forces from being built up at the corners. The blades can't foul. They are protected at both sides by heavy rims and large clearances.

When you need continuous service, year in and year out, insist on Terry solid-wheel turbines.

THE TERRY STEAM TURBINE COMPANY
TERRY SQUARE, HARTFORD 1, CONN.

TERRY

SEND FOR THIS NEW BOOK!

Discusses in detail the design and performance of the Terry solid-wheel turbine. Ask for bulletin S-159.

TT-1222

YOU CAN COUNT ON POWELL VALVES

Performance proves it, year after year—you can count on Powell Valves to help you solve the toughest flow control problems of corrosion, erosion, temperature or pressure in the chemical and process industries.

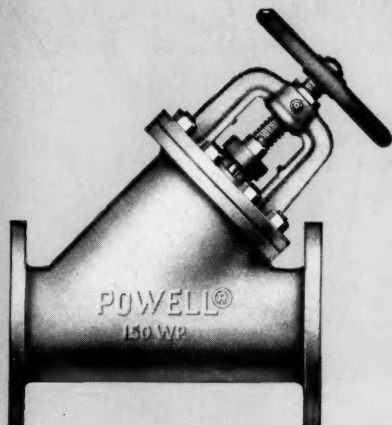
This truly dependable performance results from many things—among them Powell's engineering know-how, accumulated during 115 years of valve manufacture...the skillful use of the widest selection

of quality materials—bronze, iron, steel and alloys.

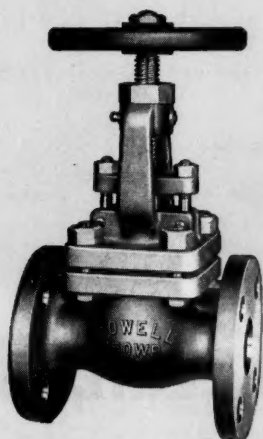
Then, too, you can count on getting the Powell Valve you need, when you need it. That's because Powell maintains a nationwide network of well stocked distributors backed up by factory inventories, warehoused "ready to go."

Get the full story from your nearby Powell Valve Distributor, or write us direct . . . The Wm. Powell Company, Cincinnati 22, Ohio

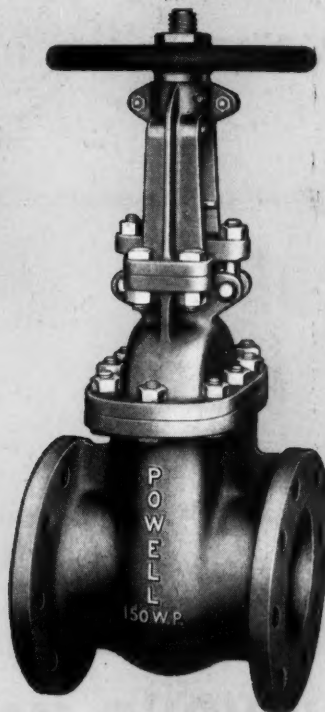
150-pound Stainless Steel Horizontal Swing Check Valve—Fig. 2433SS. Bolted, flanged cap. Renewable disc, integral seat. Sizes, 2" through 12". Screwed end valves available.



150-pound Stainless Steel "Y" Valve—Fig. 1944. Bolted flanged yoke-bonnet, outside screw rising stem. Renewable disc, integral seat. Sizes, 4" through 8".



150-pound Stainless Steel Globe Valve—Fig. 2475. Bolted flanged yoke-bonnet. Outside screw rising stem. Renewable plug type disc, integral seat. Sizes, 1/4" through 3".



150-pound Stainless Steel Gate Valve—Fig. 2453. Bolted flanged yoke bonnet, outside screw rising stem. Fully guided interchangeable solid or split wedge—integral seat. Sizes, 2 1/2" through 18".

Refer to our Catalog in Chemical Engineering Catalog

115th year of manufacturing industrial valves for the free world

POWELL CORROSION-RESISTANT VALVES

THE WM. POWELL COMPANY CINCINNATI 22, OHIO





PICK YOUR IMPELLER, PICK YOUR PUMP

Of course, you never bought an impeller and then bought the pump later. But 'pick your impeller, pick your pump' is one way of suggesting you put *performance* before *standardization*.

Sure, we can give you pumps from a complete standardized line. We can, for example, show you how four basic frames are used in six different pump types and 127 different models. And we can show you one bearing that spins in 51 different sizes, or one shaft that turns in 39 sizes. So far as we know, there's no more standardized line of centrifugal pumps than this.

But we can't help reminding you that the day-to-day economy of any pump lies in its operating efficiency plus how close it comes to meeting your exact performance

requirements. Only after these conditions are met does a minimum number of parts lying in your storeroom really count.

So, to you it's most important that this line of Worthington SESC pumps contains more (not less) different types of impellers than any other line. It contains open, closed and semi-open impellers. Each is available in five different materials to handle abrasive or corrosive materials, water or slurries. In fact, because of the extensive impeller selection, this line offers a 'customerized' pump selection meeting more specific performance requirements than any other line.

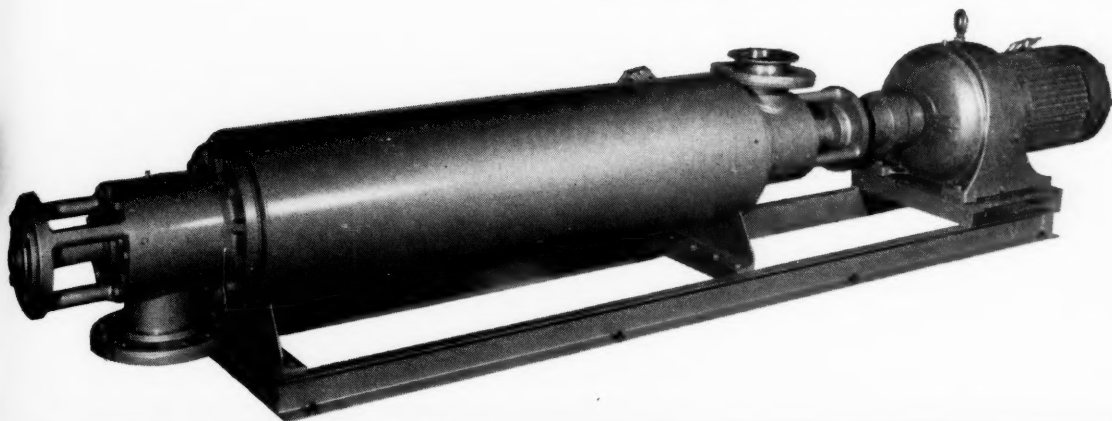
But don't take our word for it. Take a look at the SESC pump line. You'll see it's standardized to the nth degree in ratings

up to 3000 gpm and 550 ft. heads. But there are more impellers to choose from ... thus you can buy a custom built pump at standard prices.

For the name of your nearest Worthington distributor consult the Yellow Pages or write Worthington Corporation, Section 20-18, Harrison, New Jersey.

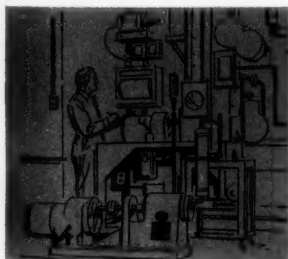


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VOTATOR Reactors, supplied for liquid or vapor jacket media, in various metals and designs, and in sizes to suit thruput needs, have high mixing efficiency with good rate of heat transfer. These units feature:

- Working pressures to 500 psi.
- Working temperatures to 750° F.
- Multi-port injection of reactants.
- Low resident time.
- Low pressure drop.
- ASME Coded.



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HEATING
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Continuous processing has become a basic necessity in the rapidly expanding chemical industry. In fact, without it, the cost cutting benefits of increased production are practically impossible. The specially developed VOTATOR Continuous Processing Equipment has been the way to increased production, to lower costs, to improved product quality, to better profits.

Designed for controlling many highly exothermic reactions, the VOTATOR Continuous Reactor is one of the most efficient heat transfer mechanisms known. It permits handling of those reactions which evolve considerable quantities of heat as well as those end products which are exceedingly viscous or result in a product which fouls a conventional heat exchange surface.

The ability of VOTATOR Continuous Process Equipment and Systems to step up quality and profits is the result of unmatched experience through many years of direct application . . . and you can put this practical experience to work in solving *your* problems. Get the whole story. Write today for Bulletin V250-12J, Girdler Process Equipment Division, Chemetron Corporation, Louisville 1, Kentucky. Sales Offices: Louisville, New York, Chicago, Marietta (Georgia), San Francisco.

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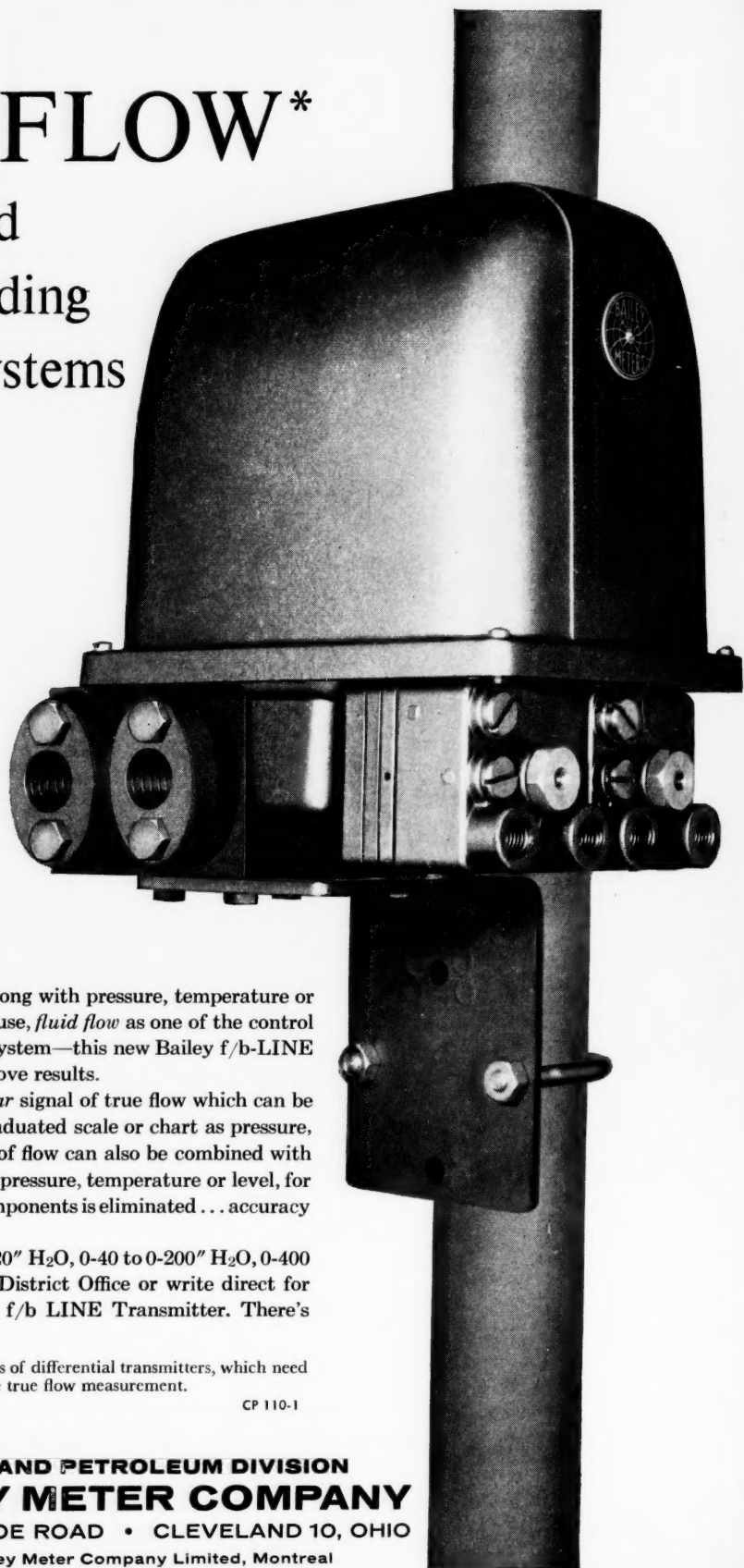
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Measures

TRUE FLOW*

to simplify and
improve recording
and control systems



If you intend to record *fluid flow* along with pressure, temperature or level—or if you now use, or plan to use, *fluid flow* as one of the control factors in a multi-element control system—this new Bailey f/b-LINE Transmitter can simplify and improve results.

It measures and transmits a *linear* signal of true flow which can be recorded on the same uniformly graduated scale or chart as pressure, temperature and level. This signal of flow can also be combined with other linear signals such as those of pressure, temperature or level, for improved control. Need for extra components is eliminated . . . accuracy of flow reading is increased.

Wide selection of ranges: 0-4 to 0-20" H₂O, 0-40 to 0-200" H₂O, 0-400 to 0-2000" H₂O. Call your Bailey District Office or write direct for complete data on the new Bailey f/b LINE Transmitter. There's nothing like it.

*As opposed to pressure-drop measurements of differential transmitters, which need external square root extractors to produce true flow measurement.

CP 110-1



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Whether you're a large or small purchaser of high quality chemicals you can depend on receiving personalized service from PITT-CONSOL. This comfortably-sized, flexible subsidiary of Consolidation Coal Company draws on the parent company's imaginative research and inexhaustible resources . . . adapts to your specific requirements.

For the best deal in service and high quality chemicals — specify PITT-CONSOL.

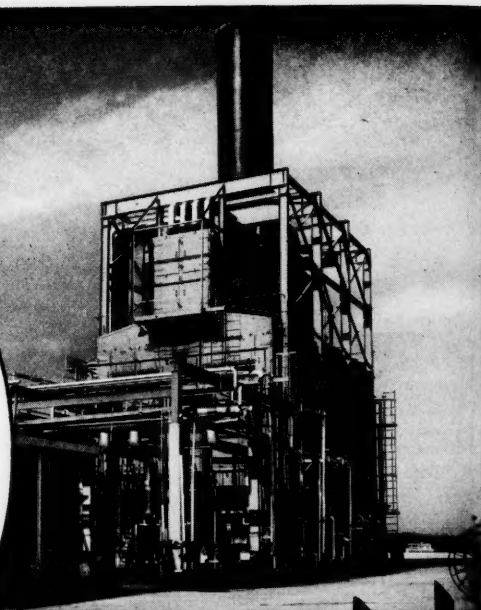
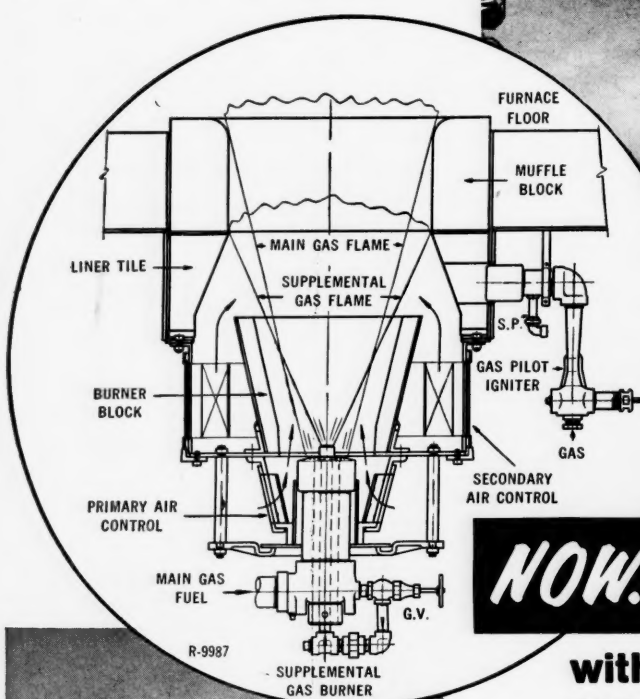


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NOW... greater VERSATILITY

with National Airol C. P. gas firing burner units

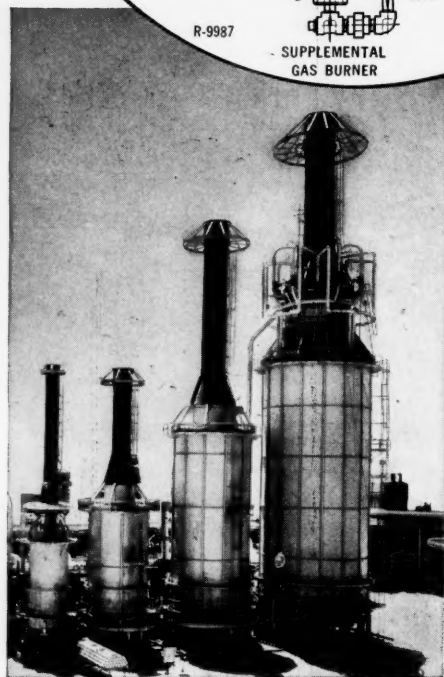
Throughout the world... in chemical, petroleum, process, pipeline and related industries, National Airol CHEMICAL-PETROLEUM up-firing burner units are achieving widespread field acceptance. And for good reason!

In accordance with our continuing policy of product improvement, the present design of this gas firing unit (now in actual quantity use) offers several time-and-money-saving "first time" features:

- An increased proportion of combustion air can be induced, partially independent of stack-furnace draft.
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- Capability exists for changing to different gases with some variation in specific gravities and calorific value to maintain approximately the same gas fuel pressures and heat release.
- Proper flame outline can be obtained relative to the furnace dimensions and proximity of tube surfaces.
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- Regulation ease and capacity flexibility are assured.

National Airol C. P. gas units can be supplied with a medium pressure gas pilot for electric ignition. A sufficient range of sizes is available to handle standard capacities. A similar National Airol design also can be furnished for oil only, for combination gas and oil, or for forced draft.

Literature on these versatile C. P. burner units, together with technical and engineering data is available. Why not write for it today while you're thinking about it?



Established 1912
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NATIONAL AIROL BURNER COMPANY, INC.

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Industrial Oil Burners, Gas Burners and Combustion Equipment

PROBLEM SOLVED!

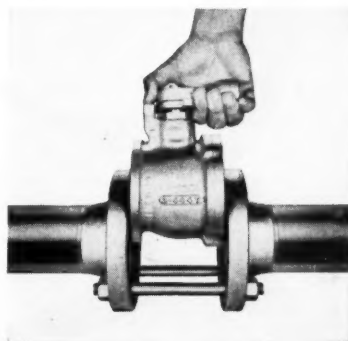
A 3" Econ-O-Miser Ball Valve Controls Abrasive Slurry at Pantasote Company

The combination of several unique design features of the Flange Econ-O-Miser Ball Valve helped solve a troublesome problem at Pantasote Company, Passaic, New Jersey, makers of polyvinyl chloride resin. This fluid, actually a granular solid slurry, required a valve with a wiping action. With the Econ-O-Miser design, the ball

is wiped clean by the seats each time the valve is operated eliminating the danger of binding or of trapping solid material. A ball valve was selected over a gate valve because the $\frac{1}{4}$ turn feature allows operation from the floor by using a lever, and the position of the lever indicates whether the valve is open or closed.

The body of the Econ-O-Miser ball valve mounts directly on the flange of the vessel, without the usual flange pipe end. This eliminated any dead space where "puddling" could effect the reaction. Econ-O-Miser Ball Valves can provide similar installation advantages, superior performance, and substantial dollar savings for you!

Econ-O-Miser Flange Ball Valve ... 3" Size Illustrated. Size Range ... $\frac{1}{4}$ " through 6". Seat and Seal Materials ... Buna-N, Teflon and Neoprene. (Other Materials Available.)



Write for complete technical information, or contact your local Worcester stocking distributor!



WORCESTER VALVE CO., INC.

17 PARKER STREET, WORCESTER, MASS.



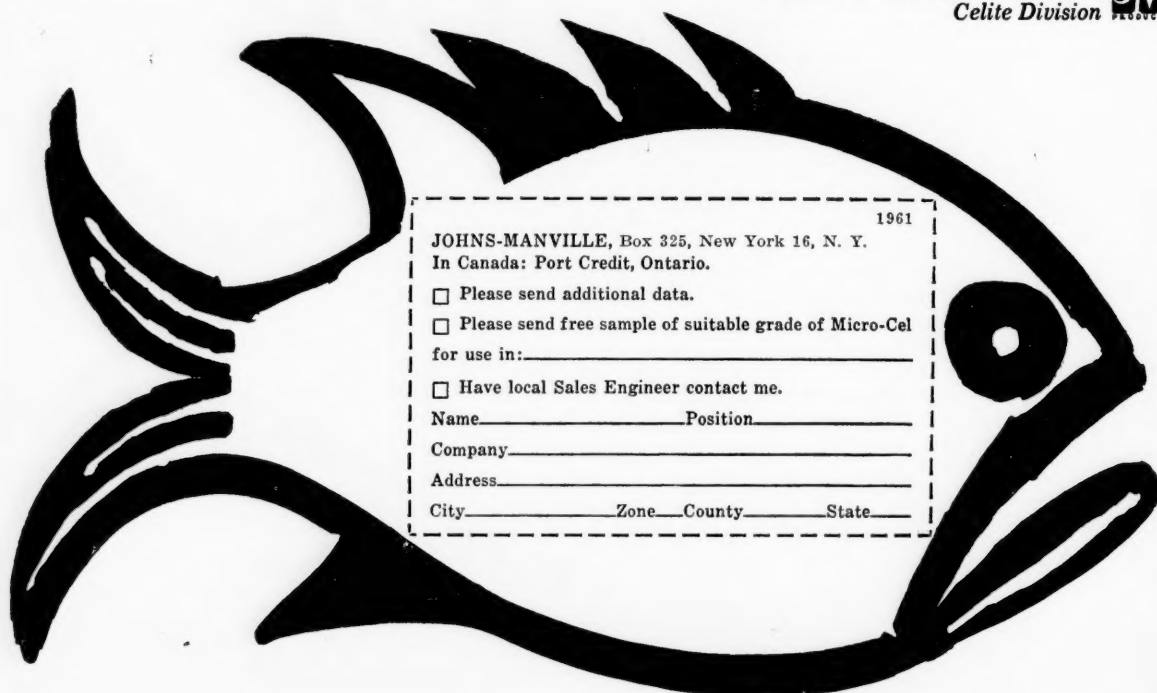
Electron micrographs showing
Micro-Cel grade distinctions.

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Micro-Cel drinks like a fish!

Micro-Cel®, Johns-Manville's new line of synthetic calcium silicates, absorbs up to 6 times its weight in water . . . remains a free-flowing powder after absorbing triple its weight in liquid. 4½ lbs. bulk to a full cu. ft. Costs only 7 to 8¢ a lb. (F.O.B.). Surface areas up to 175 sq. m/gr. Micro-Cel's varied and unique characteristics can solve unlimited formulating problems. For information, samples and assistance, mail coupon!

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JOHNS-MANVILLE, Box 325, New York 16, N. Y.
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☐ Please send additional data.

☐ Please send free sample of suitable grade of Micro-Cel
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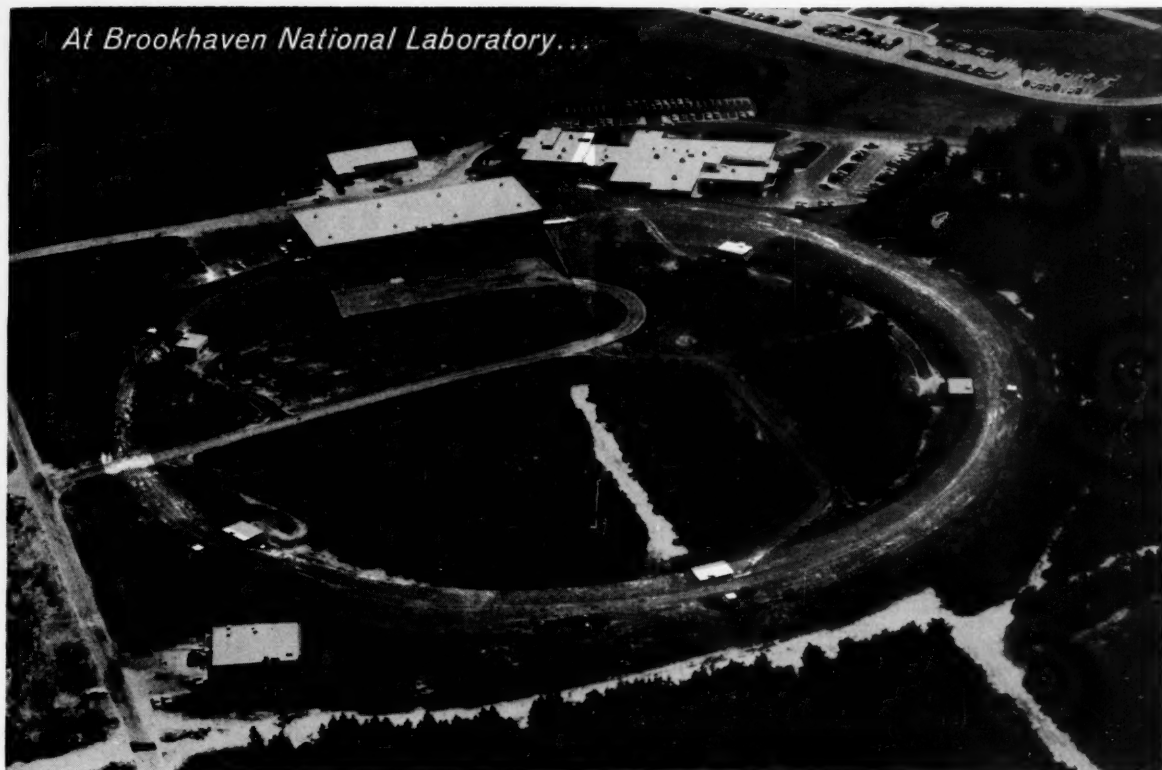
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At Brookhaven National Laboratory...



30 Billion Atom-Smashing Volts Keep On Target With Help Of A Sel-Rex Rectifier!

Promising to unlock the innermost secrets of the atom, the world's largest high-voltage proton accelerator circles underground—hidden from the casual observer beneath ten feet of earth and a carpet of new grass. Named the Alternating Gradient Synchrotron, or AGS, the high voltage atom smasher is the pride of the famous Brookhaven National Laboratory, Upton, N. Y., home of many major achievements in atomic research.

Completed last year, the Accelerator sends pulses of high energy protons hurtling around a circular, half-mile course. This proton thrust steps up in speed and voltage as it circles counterclockwise along its track.

At the end of the high speed run, its protons are traveling at close to the speed of light. This surging force of 30 Billion Electron Volts, directed into a target building, is used experimentally to learn further secrets of the atom . . . to find new particles of matter.

At the heart of Brookhaven's AGS is a series of powerful electro-magnets which bend and focus the circling stream of protons. The vital focusing magnets which aim the high power proton force at the end of its trip are powered by D.C. current from a Sel-Rex silicon rectifier. The rectifier helps focus the shattering 30 Bev force precisely on target with essential reliability.

Just one of the thousands of important jobs Sel-Rex rectifiers are called upon to do in leading plants and laboratories, the Brookhaven application is one in which exacting standards were demanded—and met, as a matter of course!

And for your special current needs—for reliable, continuous conversion of A.C. to D.C.—choose Sel-Rex, the industry-proved rectifiers that more than pay for themselves in unequalled dependability and maintenance-free service.

Send for Free "GUIDE" to Industrial Rectifier Equipment



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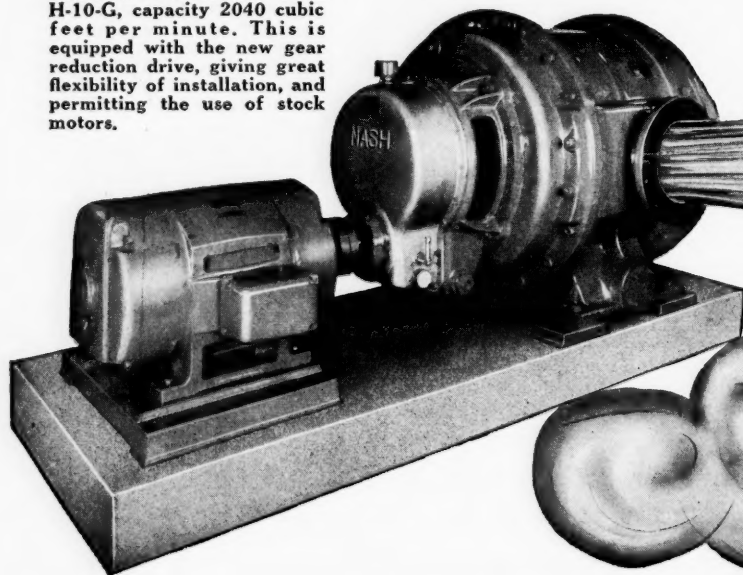
Complete Semi-Conductor Power Conversion Equipment and Systems for any AC to DC Application

Nash Compressors Tame "Hard-to-handle" Corrosive Gases

The reasons for the success of Nash Compressors in handling "dirty" and corrosive gases are simple. First, Nash Compressors have no internal parts in wearing contact, or requiring close tolerances and internal lubrication. Second, because of the Nash operating principle, a variety of liquids can be employed as the compressant medium, protecting the interior from corrosive action. Third, the pump casing may be fabricated from a variety of special metals and alloys. That is why Nash Compressors take these rugged jobs in stride.

Nash Vacuum Pumps offer the same basic advantages when handling corrosive gases, and reliably maintain vacuums up to 29.50 inches of mercury.

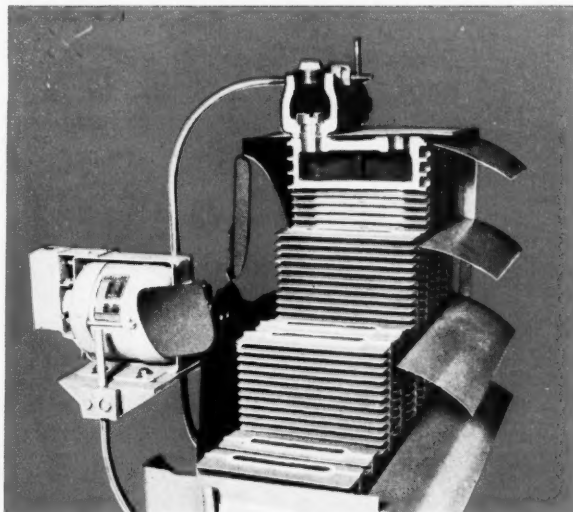
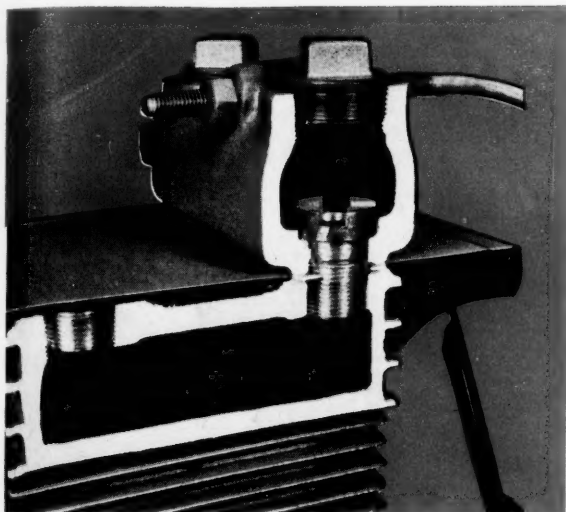
Shown here is the new Nash H-10-G, capacity 2040 cubic feet per minute. This is equipped with the new gear reduction drive, giving great flexibility of installation, and permitting the use of stock motors.



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ARGON
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NITROGEN
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PHOSPHOROUS
PENTOXIDE
SULPHUR GAS
VINYL
ACETATE
VINYL
CHLORIDE
AND MANY
OTHERS

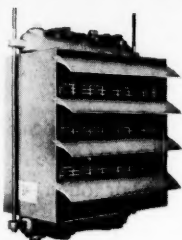
NASH ENGINEERING COMPANY
SOUTH NORWALK, CONNECTICUT, U. S. A.

only with **GRID***



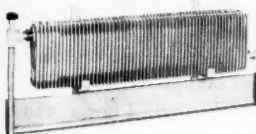
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**CAN YOU GET MAINTENANCE-FREE,
TROUBLE-FREE *Life Long* HEATING SERVICE**



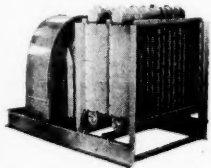
UNIT HEATERS

Available in Horizontal and Down Blow models. All cast iron built for steam pressures up to 250 PSI 450 Degrees.



RADIATORS

Various combinations with or without Grill covers. For use in confined areas where motorized units are not desirable. For low or high pressures to 250 PSI.



BLAST HEATERS

Wide range of sizes furnished with or without pressure blowers. Compact cast iron design requires less space.

It is possible because GRID is made to be maintenance-free, trouble-free... installations in 1929 are still operating without repairs. GRID construction and material - inside and out - account for GRID life long heating service.

GRID one piece cast iron steam chambers and headers eliminate internal corrosion... There's only one metal in contact with steam. No electrolysis is developed internally to eat away the heating elements. No leaks from rotted cores. And, GRID is leak-proof on steam pressures up to 250 P.S.I. 450° temperature. Specially designed units available for use on super heated steam.

GRID cast iron construction resists corrosion externally from acid fumes or other destructive elements in the atmosphere... cannot destroy GRID cast iron fin heating surface. Widely spaced fins cast integral with the steam chamber will not corrode and are easy to clean... will not "mat" on air intake side.

GRID design develops low outlet temperatures, and with proper fan volumes delivers warm comfortable air to the floor... no wasted heat at ceiling.

For trouble-free heating in your plant, write for complete information on GRID... ask for GRID products catalog No. 956.

D. J. MURRAY MANUFACTURING CO.
Manufacturers Since 1883 WAUSAU, WISCONSIN

REPRESENTATIVES IN ALL PRINCIPAL CITIES

accuracy

ASHCROFT DURAGAUGES measure pressure with precise accuracy
no matter how severe the conditions of service



Ashcroft Duragauges are available in pressure ranges from 15 psi (or vacuum) minimum to 100,000 psi. Dial sizes: 4½" through 12".

sustained

The Bourdon tube in Ashcroft Duragauges is manufactured to precision standards of flexibility and mono-linked to the rotary movement. When pressure flexes the tube, the gauge pointer is always positively positioned, because it is mounted on the geared center shaft of the movement. Sustained high accuracy and long life are assured.

Choose your Ashcroft Duragauges made of components best suited to your needs. Eight Bourdon tube materials are available. Move-

ment of stainless steel with nylon bearings and pinion gear for longest wear. Case materials: special aluminum alloy or tough phenol plastic.

The unique "Maxisafe®" Duragauge provides absolute protection to the viewer, plus easy and quick access to the mechanism. Your industrial supply distributor will help you select the best combination of components for your Ashcroft Gauge requirements. Phone him today or write for Catalog 300B.



ASHCROFT PRESSURE GAUGES

A product of

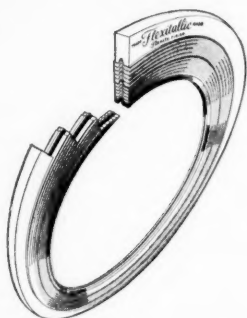
MANNING, MAXWELL & MOORE, INC.

Gauge and Instrument Division • Stratford, Connecticut

Canada: Manning, Maxwell & Moore of Canada, Ltd., Galt, Ontario
Latin America: Export Division, Chrysler Building, New York, N. Y.
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Lifeline of progress ... where gaskets must not fail



Flexitallic®
SPIRAL-WOUND GASKETS

In the processing of hydrocarbons, and in the steam lines of today's refinery, where the price of gasket failure is high, engineers rely on Flexitallic Gaskets. Flexitallic's engineered spiral-wound construction gives yield characteristics to the gasket that provide extra safety under critical sealing conditions.

Every Flexitallic Gasket is designed for a specific application. Flange geometry, bolt load, pressure, temperature, corrosion, vibration, joint stress — all are considered. Flexitallic engineers then select the type of metal and filler to provide the proper seal. In the Flexitallic Gasket shown, the Flexite Finish protects the gauge ring in corrosive atmospheres.

For temperatures from extreme sub-zero to maximum temperatures compatible with available metals. Pressures ranging to 15,000 lbs. p.s.i., temperatures to 2500°F. do not impose impossible limitations.

Give us the facts about your most serious sealing requirements — in chemical processing, petroleum, power, marine, aircraft and missiles, diesel, or any other field. There's a Flexitallic Gasket to meet your needs — or Flexitallic will design one.

FLEXITALLIC GASKET COMPANY
Camden 2, New Jersey
Stocking Distributors for Standard
Flexitallic Gaskets in principal cities

Now: the USER-PLANNED Receiver New Bristol Metagraphic

*offers you more features for easy installation, flawless operation, and fast,
no-down-time servicing than any other 4-inch-chart pneumatic receiver.*

At last, here's the ideal pneumatic receiver for graphic panel applications.

It's Bristol's new Series 670 Metagraphic, the receiver with complete plug-in versatility and convenience, plus these new user-designed features:

Simplified control switching between functions—Allows the easiest start-up procedures for automatic or cascade operation. Just adjust process to line up color-coded indicators and switch to automatic or cascade operation as desired.

Uniform control switching—All receiver models have the same convenient, easy-to-remember switch positions for the various types of control: cascade position, 3 o'clock; manual position, 6 o'clock; and automatic position, 9 o'clock.

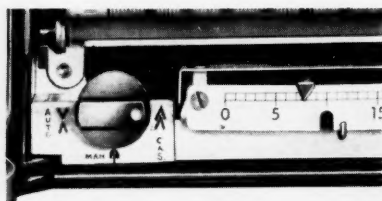
Simplified chart change and inking—Chart changing is a one-hand operation. A new chart can be slipped into place in an instant. The capillary inking system can be filled from the front of the receiver.

And that's not all: Series 670 gives you such outstanding features as rectilinear chart coordinates for easiest reading, easy connections for any type of control, and sparkless mercury-switch disconnect of electrical circuit when plug-in chassis is withdrawn.

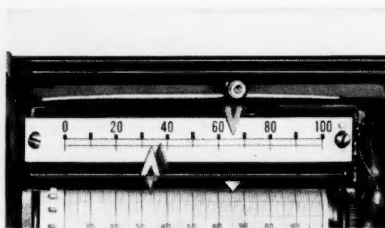
Write for complete data on the new Series 670 today. The Bristol Company, 109 Bristol Road, Waterbury 20, Conn., a Subsidiary of American Chain & Cable Company, Inc.



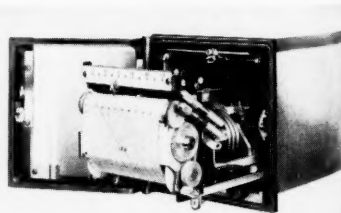
O.43



Simplified, uniformly-planned control switching facilitates process start-up and operator training.

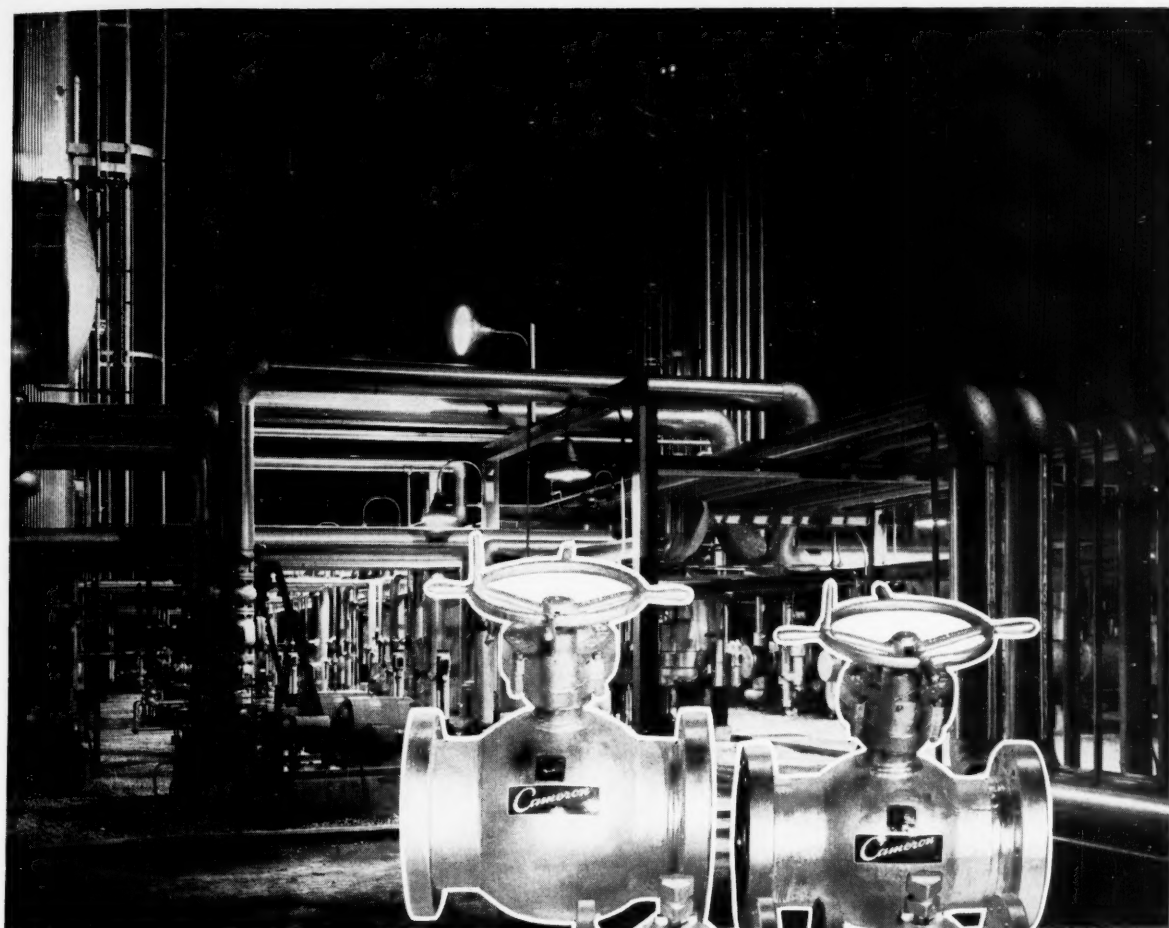


Brightly-colored distinctively-shaped pointers signal process deviation from set-point, even at a distance.



Complete plug-in versatility—long a Metagraphic feature—insures continuity of service.

BRISTOL...for improved production through measurement and control
AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

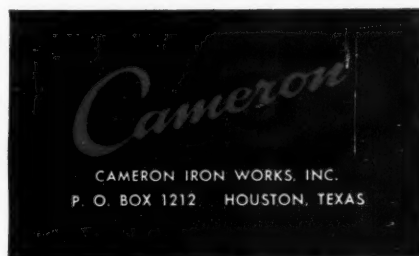


ACCEPTED BY PLANTS AND REFINERIES

Cameron Ball Valves are finding many uses in chemical plants and refineries. Cameron Ball Valves are non-lubricated, thus affording freedom from product contamination by lubricant. Cameron Ball Valves have no bonnets or glands to leak. They have bubble-tight shut-off without adjustment and require no maintenance. These features are especially valuable at plants and refineries.

Cameron Ball Valves have been tested for three years in many types of service. The large volume of repeat orders attests to their savings for customers and their outstanding performance. They are compact, amazingly easy to operate and can be equipped with wrench, hand-wheel or power operators. Cameron Ball Valves are available in sizes 2" and larger, 150# ASA to 1500# ASA.

Have you checked on what Cameron Ball Valves can do for you?



CAMERON BALL VALVES



A Yuba Heat Transfer Corporation Petro-Chem cylindrical heater being lined with B&W Insulating Firebrick.

Why Should This Oil Heater Lining Last 21 Years – or More?

THE ANSWER: B&W INSULATING FIREBRICK

Since 1940 B&W Insulating Firebrick have been used to line over a thousand oil heaters of this type. B&W K-1620, K-20, or K-23 IFB are being used successfully for direct exposure in this service, depending on operating conditions. Recent inspection of many units has shown that the B&W IFB linings were still in excellent condition. That's why Yuba Heat Transfer Corporation looks forward to a long and profitable service life from each new B&W IFB lining.

B&W Insulating Firebrick reduce over-all cost in chemical and petroleum process furnaces because they offer:

Long Life — B&W Insulating Firebrick are long lasting because of the exceptional refractory nature of their base

ingredients and the high processing temperatures to which they are subjected during manufacturing.

High Hot Load Strength — B&W IFB provide maximum load-bearing capacity under operating temperatures. Many oil heaters have been built with walls 80 feet high with no intermediate supports.

Low Heat Flow — The porous structure of cost-cutting B&W IFB gives excellent insulating properties and this means extremely low heat flow.

Bulletin R-38 contains complete data on lightweight B&W Insulating Firebrick. Write for your copy to The Babcock & Wilcox Company, Refractories Division, 161 East 42nd Street, New York 17, New York.



B&W

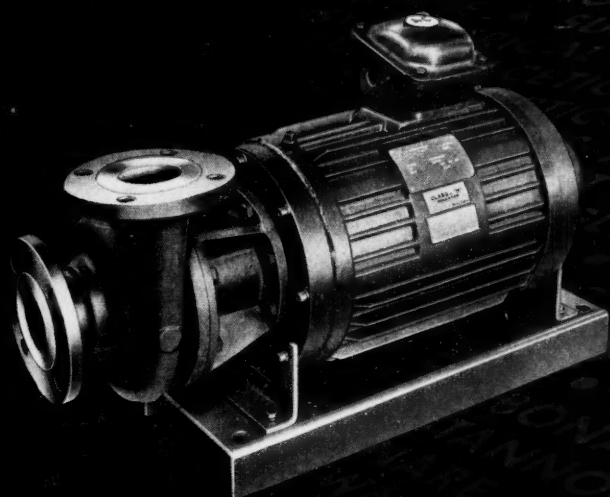
THE BABCOCK & WILCOX COMPANY

REFRACTORIES DIVISION

B&W Firebrick, Insulating Firebrick, and Refractory Castables, Plastics, Ramming Mixes, Mortars, and Ceramic Fiber.

The remarkable leakproof

electri- CAND PUMP



Now, pump the "unpumpable" with Electri-Cand pumps

Available for any solids-free liquid . . . Underwriters-approved for ratings up to 91 psi . . . nearly twice the approved rating of any other "canned" pump.

For *absolute* leakproof performance that eliminates the possibility of contamination or loss, select *Electri-Cand* pumps from Allis-Chalmers. Choose from industry's broadest line . . . including a wide range of sizes approved by Underwriters' Laboratories for Class I, Group D hazardous locations.

Electri-Cand pumps handle practically everything from Acetaldehyde to Xylene. They save precious liquids, retain volatile liquids, contain toxic fluids and fumes, handle corrosives safely. Stuffing boxes are completely eliminated. Bearings take care of themselves . . . they are lubricated by the pumped liquid. And *Electri-Cand* pumps are easily designed into any installation. Compact close-coupled design eliminates misalignment . . . saves space . . . allows mounting in any position.

For efficient, safe handling of "problem" liquids, contact your A-C representative, or write to **Allis-Chalmers**, Industrial Equipment Division, Milwaukee 1, Wisconsin.

A-1520



Every *Electri-Cand* pump is thoroughly tested before shipment. Performance characteristics are checked. Each unit is hydrostatically tested. Here, Freon #12 is forced into a partially evacuated pump, and a halogen leak detector is used. The pump is rejected if it leaks at a rate of more than one ounce per 100 years. *Electri-Cand* is an Allis-Chalmers trademark.

ALLIS-CHALMERS



New Process Aid



Silicone Coated Papers Speed Processing of Sticky Products

When processing sticky materials and products, such as raw rubber, candy or resin-bonded laminates, "stickers" can cause lost time and extra cost. They can, but don't . . . if you specify interleaving or process papers with the new Syl-off® silicone stickproof coatings. Syl-off coated papers give quick, easy and complete removal of sticky products, help keep production moving smoothly, hold product waste to a minimum.

AIDS PACKAGING, TOO. Syl-off coated paper and paperboard are now used in packaging a variety of sticky products . . . from asphalt to sweet rolls, from adhesive masses to candied fruits. Standard containers available with Syl-off coated liners or inner surfaces include multiwall bags, fiber drums, unit containers, cores and cartons. Pan liners and wrappers coated with food grade Syl-off may be used in contact with food in compliance with the provisions of the Food Additives Amendment of 1958.

MORE ADVANTAGES. Syl-off coatings have natural nonoily lubricity and water repellency . . . won't migrate, contaminate or transfer . . . won't alter the characteristics of paper stock. Whether you process, ship or receive sticky materials, Syl-off coated papers are worth looking into. For the complete list of Approved Sources, plus a descriptive brochure, write Dow Corning, Dept. 2421.



For complete technical information about any silicone product, contact the Dow Corning office nearest you.



Dow Corning CORPORATION
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.



EXPLOSILARM

New M-S-A® Explosilarm is small, completely self-contained Combustible Gas Alarm—features low cost and low maintenance

Employed here, in the design of the Explosilarm, is over 30 years of MSA experience in the field of combustible gas analysis. This experience enables us to market a Combustible Gas Alarm offering minimum first cost, negligible installation cost, and very little maintenance. The result is greater economy and safer operations for the user.

Accuracy and reliability of the Explosilarm are predetermined through the use of quality parts and fine craftsmanship. The platinum filaments in the balanced-bridge circuit are specially designed for long service life, interchangeability without matching pairs, and extreme zero and calibration

stability. The locking panel prevents tampering with controls by unauthorized personnel, and assures proper operation without interruption.

The self-contained feature of the unit is important too. Motor and pump assembly, meter, relay, and all other components, are housed in a cabinet that measures only 8 3/4" wide by 14 1/4" high. This cabinet protrudes only 6 1/4" from the surface on which it is mounted.

An M-S-A Instrument Specialist will be happy to discuss your specific problems with you. Contact him soon. And write us for new bulletin on the operation of the Explosilarm.

MSA

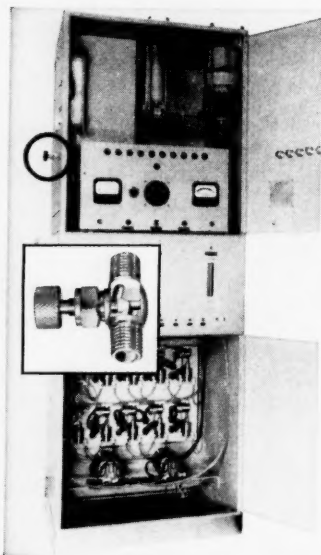
INSTRUMENT DIVISION

Mine Safety Appliances Company
Pittsburgh 8, Pennsylvania

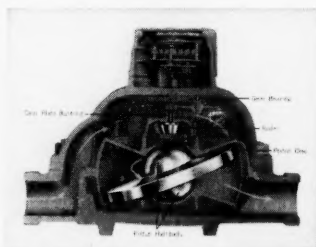


THE RAW MATERIALS OF PROGRESS

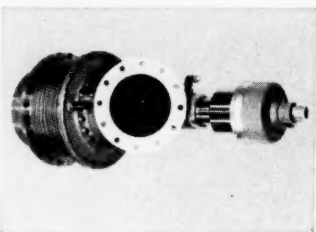
KEL-F® 81 curbs corrosion in meters, valves, seals—what can it protect for you?



Assures positive shut-off in gas analyzer valves!



Retains shape, dimension to keep meters on the mark!



Seals in chemical corrosives, even at -400°F (or up to +400°F).

In chemical handling apparatus, KEL-F 81 Brand Plastic defeats corrosion—does it over an unusually wide temperature range, under high pressures, with mechanically strong parts made to a high degree of precision.

In volumetric meters, for example, such vital parts as piston discs and half balls are made of KEL-F Plastic. This material maintains shape and dimension, keeps meters accurate despite attacks by acetic acid, aluminum nitrate, carbon bisulfide, diethylamine, concentrated sulphuric acid, other chemical corro-

sives. In gas analyzers that monitor fume leakage, KEL-F Plastic provides durable needle valve tips that assure positive shut-off of highly corrosive liquids and gases. For critical missile fuel seals, KEL-F Plastic retains flexibility, holds in LOX fuel at -297°F, holds liquid nitrogen at -320°F and liquid hydrogen at -432°F.

What chemical corrosives can new KEL-F 81 Plastic tame for you? Check the "profile" at right, then call the nearby 3M Chemical Representative for complete technical information and assistance.

Properties Profile

on KEL-F® 81 PLASTIC BRAND

KEL-F 81 Plastic is a fluorocarbon plastic, a thermoplastic resin formed by the homo-polymerization of chlorotrifluoroethylene. The high degree of fluorination of KEL-F 81 Plastic is responsible for its chemical inertness and thermal stability. The inclusion of chlorine in an otherwise carbon-fluorine molecule results in exceptional moldability and mechanical toughness.

Crystallinity. KEL-F 81 Plastic is crystallizable, but not necessarily crystalline, the degree and kind of crystallinity in a given sample being a function of its thermal history. The "quick quenched" resin is spoken of as amorphous, and the "slow-cooled" resin as crystalline. When crystalline, KEL-F 81 Plastic is a denser, more translucent material with higher tensile modulus, lower elongation, and greater resistance to the penetration of liquids and vapors. The amorphous plastic is less dense, more elastic, with greater optical clarity and toughness.

Physical Properties. The physical properties of KEL-F 81 Plastic combine mechanical, chemical, electrical, and optical advantages. And the most useful applications center around combinations of the following properties:

1. Useful temperature range: from -400°F. to +400°F.
2. Resistance to deformation and flow at high temperatures, pressures
3. Zero moisture absorption
4. Abrasion resistance
5. Radiation resistance
6. Chemical resistance
7. Electrical properties
8. Infra-red transmission
9. Inert to liquid oxygen
10. Flexible in contact with cryogenic fuels

Processing. KEL-F 81 Plastic can be processed in the same manner as other thermoplastic resins. Parts of KEL-F 81 Plastic may be specified in any form. However, because of time and temperature limitations, compression molding is the ideal method for retaining all of the desirable mechanical properties originally built into the basic polymer. Other processing methods, such as injection molding and extruding can be used to achieve the same degree of quality, but special attention to processing techniques is required to avoid excessive degradation.

Detailed discussion of the properties, applications and other technical data is contained in a free brochure. For your copy, write 3M Chemical Division, Dept. KAL-91, St. Paul 6, Minn.

"KEL-F" is a reg. TM of 3M Co.

MINNESOTA MINING AND MANUFACTURING COMPANY
...WHERE RESEARCH IS THE KEY TO TOMORROW



INDUSTRIAL

Swingomatic HORIZONTAL PRESSURE FILTERS

To learn how these units have been applied to filtration of a solution at pH 5.5, 180° F., Sp. G. 1.3, containing 0.4% SOLIDS, (by weight), with provisions for washing the filter cake in place, write INDUSTRIAL for application report 100P-12-N-7.

FULL AUTOMATIC
CONTROLLER is provided with simple toggle switch for "FLIP-OVER" to SEMI-AUTOMATIC operation.



100



200



300



400



500



600



700



800

INDUSTRIAL

INDUSTRIAL FILTER & PUMP MFG. CO.
4279 Ogden Avenue • Cicero 50, Illinois



New Tractor Shovel brings new economies to Swift & Co.

Michigan introduces Model 55B, early buyer likes its mobility, increased production capacity

5,400 lb lift capacity. Buckets from $\frac{3}{4}$ to 2 yds (1 yd standard). Turn radius, only 11'2". Torque converter, power shift, power steer... these perhaps are the more important specifications of the new Michigan rear-wheel-steer Model 55B. Its main benefits: excellent maneuverability plus more capacity than previously available in its price class. Sales record to date: excellent. Example: Swift & Company's Plant Food Division.

Swift, we're proud to report, in just a few months has put Model 55B's to work in company plants in Wisconsin, Iowa, Texas, Louisiana, Georgia, North and South Carolina—in most cases alongside other Michigan models! Their experience in Madison, Wisconsin, is typical...

Turns in 11'2"

Here, Swift uses their 1 yd 55B with three other Michigans. A 16 cubic foot Model 12B Michigan unloads boxcars and feeds the raw material to bin con-

veyors. Raw storage bins to mixer, the material moves in the bucket of a $1\frac{1}{4}$ yd Model 75 Michigan. Transportation from mixed product bins to two shipping mill conveyors is the job of another Model 75 and the new Model 55B.

The 55B, with its 11'2" turn radius, has been especially productive in locations where smaller bins and narrower aisles restrict maneuvering room.

300 ft cycle: 60 loads hourly

Pictures show the 66½ hp machine feeding 6-24-24 granulated fertilizer... one cubic yard, 1890 lbs per bucket load, 60 loads per hour. Average haul, 150 feet one way. All told, the four Michigans cover an area of 36,000 square feet, help make over 100 kinds of fertilizer, 95% of it bagged.

No lost time

Conditions provide a severe test of both men and machines. The air is very

dusty. Material is abrasive and extremely corrosive. During the two or three month rush season machines must work 20 hours a day... full tilt all the time... hitting the piles hard, reversing fast, driving fast. Performance? The oldest Michigan, a Model 75 bought in February 1956, has in 12,000 working hours lost *virtually no assigned work time!* Efficiency has been equally good for the other three Michigans, including the year-old Model 55B. "Good, rugged units," is the way Swift's Madison plant manager summarizes it. "Our Michigans sure do a lot of work for us!"

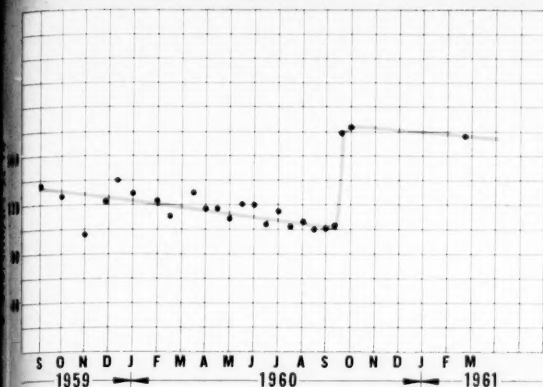
Michigan is a registered trademark of
CLARK EQUIPMENT COMPANY
Construction Machinery Division

CLARK®
EQUIPMENT

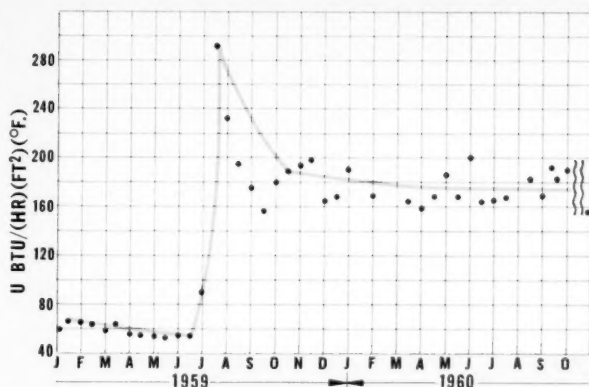
2477 Pipestone Road
Benton Harbor 25, Michigan

In Canada:
Canadian Clark, Ltd.
St. Thomas, Ontario

REBOILER A

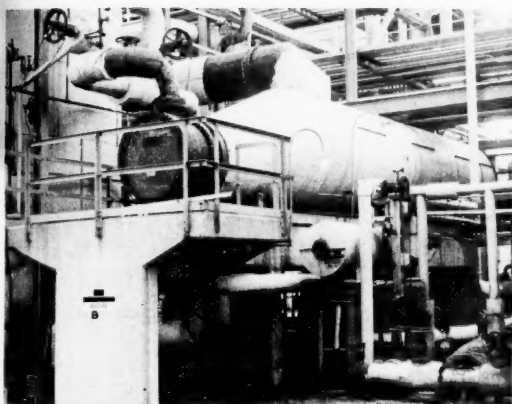


REBOILER B

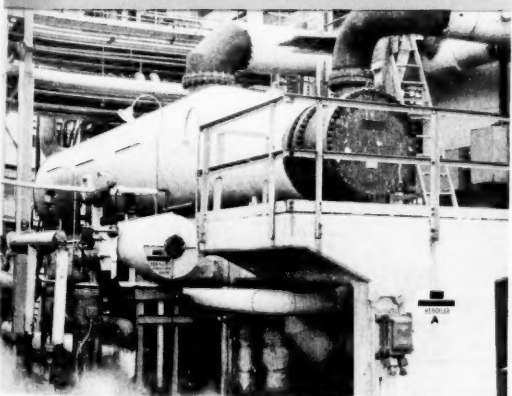


FRACTIONATING TOWER REBOILER COEFFICIENTS

Wolverine Trufin[®] Type S/T helps Sun Oil boost reboiler capacity



▲ REBOILER B



REBOILER A ▼

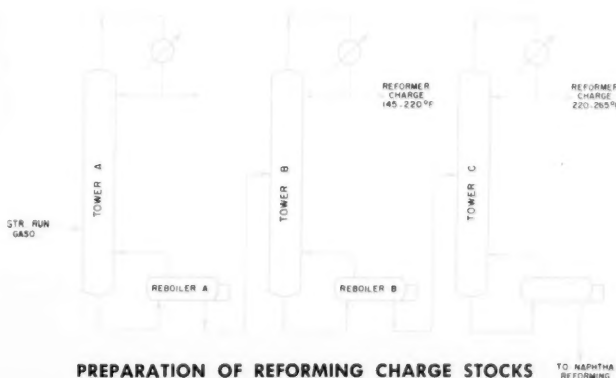
How Wolverine Trufin Type S/T—the integrally finned heat exchanger tube—boosts both tube surface area and heat transfer capacity is graphically shown by a recent Trufin installation at Sun Oil's Marcus Hook refinery.

In this application—preparing reformer feed stocks—two reboilers, tubed with bare tubes on triangular pitch, were retubed on a square pitch with Trufin Type S/T low carbon steel tubes in U-bend form.

Surface area in each unit jumped from 4400 to more than 9000 square feet. Following its retubing with 486 Trufin U-bends in June, 1959, the calculated overall coefficient of heat transfer in Reboiler B rose from a level of 60 on the bare tubes to 290 on the Trufin tubes and then, with normal fouling, leveled off at approximately 180—a threefold increase.

In the case of Reboiler A, which was retubed in September, 1960, with similar Trufin Type S/T U-bends, the calculated heat transfer coefficient rose from approximately 100 on the bare tubes to 180 on the Trufin tubes where it also leveled off.

Operations such as this, where excessive fouling on the outside of the tubes is normally encountered can, in many cases, be given a substantial performance boost through the use of Wolverine Trufin Type S/T. Why not get the Trufin story before retubing? Just ask your Wolverine salesman—HE KNOWS. Write, too, for a copy of the Trufin Catalog.



PREPARATION OF REFORMING CHARGE STOCKS

TO NAPHTHA REFORMING

WOLVERINE TUBE
DIVISION OF

Calumet & Hecla, Inc.
DEPT. Q, 17232 SOUTHFIELD RD., ALLEN PARK, MICH.

PLANTS IN DETROIT, MICHIGAN AND DECATUR, ALABAMA
SALES OFFICES IN PRINCIPAL CITIES

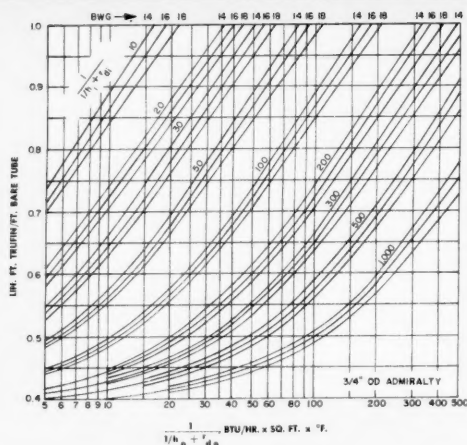


FIG. 4

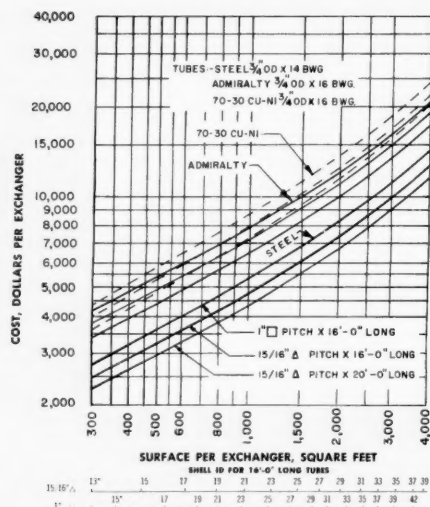


FIG. 8

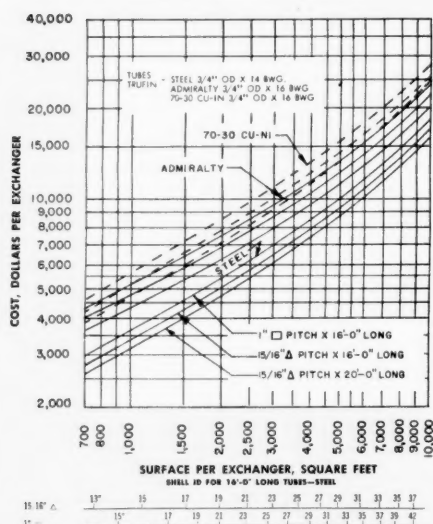


FIG. 10

Rate it for yourself

Here's a "DO-IT-YOURSELF" test designed exclusively for technical people engaged in heat transfer operations. By using the technical data on this page, you can quickly make a comparison test that will show you the actual savings you can achieve by retubing bare-tubed heat transfer units with Wolverine Trufin® Type S/T—the integrally finned heat exchanger tube.

We're sure you'll be amazed when you see—for yourself—the savings Wolverine Trufin can bring your way. For more complete information write for a free copy of the Trufin Comparison Book, from which this data was taken or, ask your Wolverine Tube salesman—HE KNOWS!

ADMIRALTY TRUFIN

For a given service the calculated bare tube cooler contains 3100 sq. ft. in a 39" ID shell. Tubes are 3/4" OD x 16 BWG x 16'0" long admiralty on 1" square pitch. The shell side coefficient and fouling factor were 150 and 0.002 respectively. The tube side coefficient and fouling factor for the water were 1000 and 0.001.

From Fig. 8, Cost=\$16,400.

Refer now to Fig. 4

$$\frac{1}{1/h_o + r_{do}} = \frac{1}{1/150 + 0.002} = 115.5 \text{ Btu/hr} \times \text{sq. ft.} \times ^\circ\text{F}$$

$$\frac{1}{1/h_i + r_{di}} = \frac{1}{1/1000 + 0.001} = 500 \text{ Btu/hr} \times \text{sq. ft.} \times ^\circ\text{F}$$

From Fig. 4, 0.59 lin. ft. of Trufin are required per foot of bare tube. There are 0.1963 sq. ft./lin. ft. of 3/4" OD bare tube.

From Table 2, there are 0.496 sq. ft./lin. ft. of 3/4" OD Admiralty Trufin.

Trufin exchanger required = $3100 \times \frac{0.496}{0.1963} \times 0.59 = 4610 \text{ sq. ft.}$

From Fig. 10, nearest full shell 31" ID.

Surface = 4690 sq. ft.

Cost = \$13,000.

Saving = \$16,400 - \$13,000 = \$3,400.

WOLVERINE TUBE
DIVISION OF
Calumet & Hecla, Inc.
DEPT. Q, 17232 SOUTHFIELD RD., ALLEN PARK, MICH.

PLANTS IN DETROIT, MICHIGAN AND DECATUR, ALABAMA
SALES OFFICES IN PRINCIPAL CITIES

TABLE II

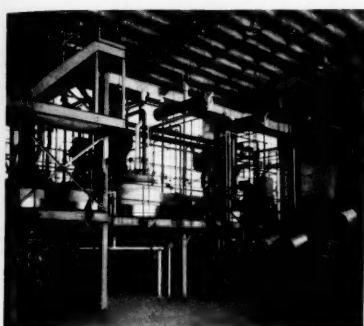
19 FINS PER INCH	NOMINAL SIZE	PLAIN SECTION DIMENSIONS		FINNED SECTION DIMENSIONS			OUTSIDE AREA	SURFACE AREA RATIO	I.D. CROSS SECTIONAL AREA In Sq. Inches
	O.D.	CATALOG NO.	O.D.	Wall Thk.	Root Dia.	Wall Thk.	Inside Dia.	Sq. Ft. per Linear Ft.	
								ao/ai	
	3/4	60-195028	.750	.049	.625	.028	.569	.496	.254
		60-195035		.049		.035	.555		.242
		60-195042		.058		.042	.541		.230
		60-195049		.065		.049	.527		.218
		60-195065		.083		.065	.495		.192
		60-195083		.095		.083	.459		.166

U.S.I. CHEMICAL NEWS

September

A Series of Advertisements for the Chemical Process Industries

1961



(Photo courtesy Metal Hydrides Inc.)

Use of dispersed sodium is key to efficient pilot and plant scale production of sodium borohydride. First step, shown here, is to make sodium hydride by reacting hydrogen gas with metallic sodium dispersed in mineral oil. The sodium hydride is later reacted with methyl borate to produce sodium borohydride. Further information on sodium dispersions is contained in U.S.I.'s 42-page brochure on the subject. For a copy, address Technical Literature Dept., U.S.I. Chemical News, 99 Park Avenue, New York 16, N. Y.

New Brochure Covers Bulk Storage of S. D. Alcohols And Proprietary Solvents

Users of specially denatured alcohol or proprietary solvents who are planning to install bulk storage tanks can get expert help from U.S.I.—America's oldest and largest marketer of industrial alcohol. The company has recently issued an 8-page data sheet: "Bulk Storage Tanks for Specially Denatured Alcohol and Proprietary Solvents."

It lists four prerequisites for installing bulk storage facilities, reviews federal regulations, discusses tank design—covering materials of construction, size and location. Two final sections provide information on auxiliary equipment and measuring devices.

(Continued on next page)

Amino Acid Intake-Protein Efficiency Relation Is Basis of New Diet Concept

Industry researchers have determined that the daily intake of essential amino acids should be proportional to the amount found in blood plasma. They find a direct correlation between dietary intake of these amino acids, their concentration in fasting blood plasma and protein efficiency.

Based on these findings, they have helped National Institutes of Health develop a diet concept which they feel will put nutritional studies on a sounder theoretical basis.

Ethylene Seen as Most Valuable Petrochemical Building Block By Chemical Process Industries

Properties and Reactions Detailed in New Brochure

Over five billion pounds of ethylene were produced and used in the United States last year. No other petrochemical, with the exception of synthetic ammonia (largely used for fertilizer), approaches this versatile material in volume consumed annually. Almost all of this volume is employed in the synthesis of chemical intermediates, or commercial chemicals such as alcohol and polyethylene. A small amount is used directly—as a refrigerant;

as a softening, ripening and coloring agent for fruits and vegetables; and as a conditioning agent for nuts.

The values of ethylene to the CPI are its low cost and its ability to polymerize or react by addition with simple, inexpensive materials such as hydrochloric acid, oxygen and chlorine—to yield extremely useful intermediates or end products.

End Products Extremely Numerous

The largest quantity of ethylene produced is consumed by the chemical industry in the manufacture of six derivatives:

- (1) Ethylene Oxide
- (2) Polyethylene
- (3) Ethyl Alcohol
- (4) Styrene
- (5) Ethyl Chloride
- (6) Ethylene Dichloride

Ethyl ether is produced concurrently with ethyl alcohol.

End products from these derivatives are very numerous, and extremely important in our chemical economy. Ethylene oxide, for example, is the starting point for monoethylene glycol, used primarily in automotive antifreeze. It is also the building block for di- and triethylene glycols, ethanolamines, glycolethers, acrylonitrile, surfactants and other compounds.

Polyethylene is the fastest growing plastic on the market today. Consumption of ethylene for polyethylene in the U.S., totalling six million pounds in 1945, is expected to reach 1.6 billion by 1965.

Over 50% of all ethyl alcohol is con-

(Continued on next page)



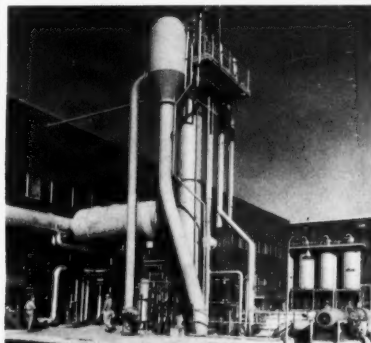
Ethylene in cylinders is sold by U.S.I. for food processing, as a refrigerant, and as a chemical raw material.

National Distillers, Owens-Illinois Form Co. to Make High-Density Polyethylene

Formation of a new, jointly owned company to make high-density (linear) polyethylene was announced recently by National Distillers and Owens-Illinois Glass Company. The name of the new company is National Petro Chemicals Corporation.

The new company will operate a plant in Houston, Texas, plans for which were announced by National Distillers last February. The plant, scheduled for completion in late 1962, will have an annual capacity of about 60 million pounds.

U.S.I. Division of National Distillers produces low and medium density polyethylene resins at plants in Houston, Texas and Tuscola, Illinois.



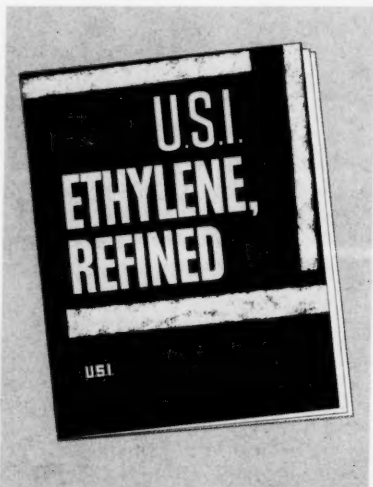
U.S.I. ethylene unit supplies 100-million lb.-per-year polyethylene plant at Tuscola, Ill.

Ethylene—Valuable Building Block (Continued)

verted to acetaldehyde which in turn is the building block for countless derivatives. These include acetic acid and its anhydride, the acetates, n-butyraldehyde, n-butanol and pentaerythritol.

The need for styrene for butadiene-styrene synthetic rubber during World War II first brought ethylene to the fore as a chemical raw material. Today, styrene is the base material for polystyrene plastics and latex paints as well.

Ethyl chloride yields tetraethyl lead and ethyl cellulose. Ethylene dichloride gives rise to ethylene amines and to a large part of the vinyl chloride produced.



New Ethylene Literature Available

The demand for ethylene is expected to reach about 6.8 billion pounds by 1965. To help those working with the material, U.S.I. has just issued a new, comprehensive brochure covering refined ethylene. It contains tables and charts of physical properties, a two-page table of refrigeration data, specifications, shipping information, applications, diagrammed chemical reactions, complete cylinder handling information and bibliography.

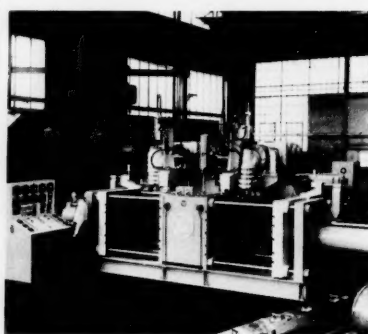
Copies may be obtained by addressing Technical Literature Dept., U.S.I. Chemical News, 99 Park Ave., New York 16, N. Y.

U.S.I. Products Make News

On these pages are news stories on ethylene, polyethylene, sodium, ethyl alcohol and proprietary solvents, all products of U.S.I. But the company also markets other chemicals which seldom make news. We'd like to list them here:

n-Butyl alcohol, amyl alcohol, ethyl acetate, n-butyl acetate, acetone, ethyl ether.

Anhydrous ammonia, ammonium nitrate, nitric acid, nitrogen fertilizer solutions, phosphoric acid, sulfuric acid, sodium peroxide.



90-Gallon, Blow-Molded Polyethylene Drum Liners Produced by New Machine

Blow-molded polyethylene drum liners of 55- to 90-gallon capacity can now be obtained, thanks to the development of a new, giant blow-molding machine. It is felt that, in the near future, the adaptation of even larger molds to this new equipment will make possible successful production of up to 250-gallon containers.

U.S.I.'s PETROTHENE® 106 polyethylene resin has been molded into 55-gallon drum liners on this new equipment.

Bulk Storage of Alcohols (Continued)

Included are diagrams of typical above-ground and underground storage tanks. Other diagrams show details for gauging wells and for anchoring underground tanks.

For copies of the new bulk storage bulletin, write Technical Literature Dept., U.S.I. Chemical News, 99 Park Ave., New York 16, N. Y.

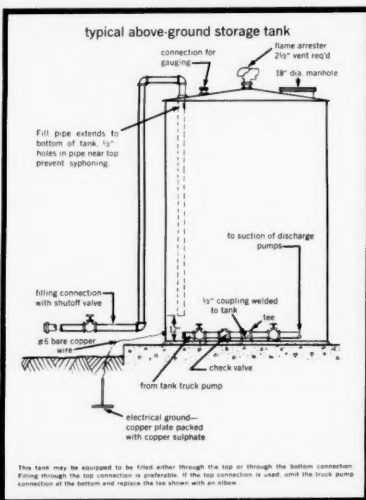


Diagram of typical above ground storage tank is included in U.S.I.'s latest Technical Data Bulletin, "Bulk Storage Tanks for Specially Denatured Alcohol and Proprietary Solvents."

TECHNICAL DEVELOPMENTS

Information about manufacturers of these items may be obtained by writing U.S.I.

Low temperature properties of copper and its alloys is subject of literature now offered. For use in cryogenic equipment, copper said to provide remarkable retention of ductility at low temperatures. **No. 1750**

Aleuritic acid (9, 10, 16-trihydroxypalmitic acid) now available in commercial quantities. Suggested for use in perfumery (civetone, dihydrocivetone, epi-ambrettolide), pharmaceuticals, plasticizers, plastics, adhesives, etc. **No. 1751**

New filter holders, for use with submicron membrane filters in processing liquids, can now be obtained. Typical uses include contamination analysis, bacteria detection, drug sterilization, production of super-pure water. **No. 1752**

Protective coating formulations, based on distilled tall oil and tall oil fatty acids, are described in a new series of data sheets just issued. Give procedures for formulating, compositions, properties, suggested uses for each. **No. 1753**

Five new 5'-ribonucleoside di- and triphosphates, for large-scale experiments in nucleic acid chemistry and synthesis, have been developed. Include cytidine compounds CDP and CTP; uridine compounds UDP, UTP and UDP Glucose. **No. 1754**

Infrared physics is subject of new journal now published quarterly from London. Covers IR theory, experiment, instrumentation as applied to IR detection and transmission, and research problems using infrared. **No. 1755**

New volumetric concentrates, for rapid preparation of standard solutions claimed accurate to 0.1%, have been introduced. Come in spill-proof ampoules said to have long shelf-life. 38 Concentrates now offered. **No. 1756**

Toluene, benzene and xylene specifications for maximum acceptable concentrations in all places of employment are provided in three newly revised ASA standards now being sold. **No. 1757**

Scientific and Technical Societies of U.S. and Canada, 7th edition, can now be purchased. This standard reference book lists 1,597 U.S. and 239 Canadian societies, both national and local, with complete details. **No. 1758**

Chlorine properties are detailed in 28-page booklet now available. Booklet includes information on shipping, handling, safety measures, uses. Illustrated with graphs, charts, photos, drawings. **No. 1759**

Please use number when writing.



U.S. INDUSTRIAL CHEMICALS CO.

Division of National Distillers and Chemical Corporation
99 PARK AVENUE • NEW YORK 16, N. Y.

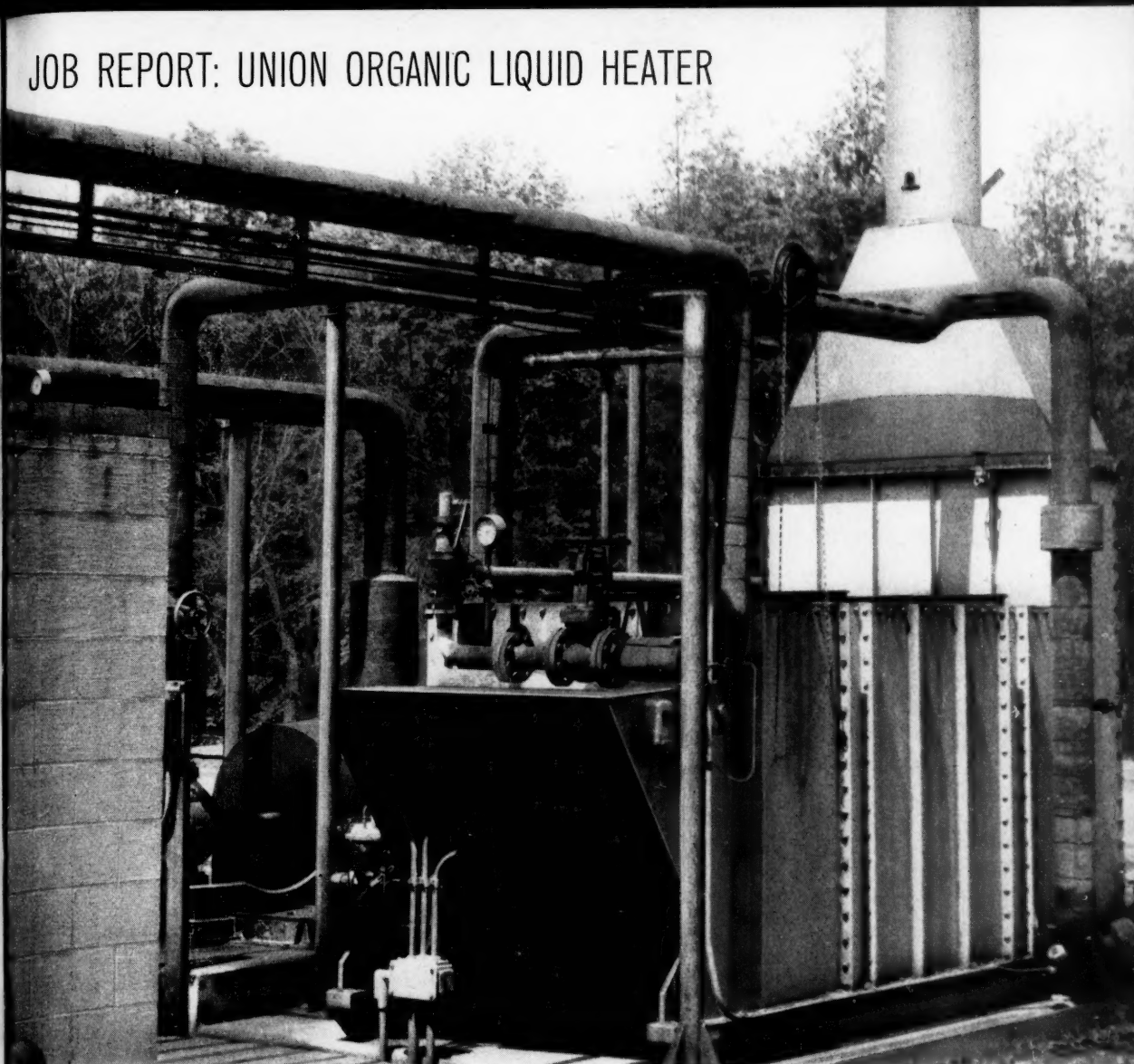
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JOB REPORT: UNION ORGANIC LIQUID HEATER



thermal efficiency "extremely good" says Reactive Metals

Serving Reactive Metals, Inc., large integrated producer of zirconium metal and titanium products, this Union Forced Circulation Organic Liquid Heater provides heating oil for melting the sodium metal used in the production of titanium sponge and zirconium chunklets. Gas-fired, the liquid heater has a capacity of 2 million BTU/hr. at 750° F and 150 psig.

In assessing performance, Reactive Metals reports that "thermal efficiency has been extremely good." This points up a major feature of Union Liquid Heaters: *counter current liquid and gas flow coupled with generous heating surface*. The lowest temperature liquid is served by the lowest temperature gas. Result: maximum thermal efficiency.

"We have been well pleased," concludes Reactive Metals. "Performance certainly confirms the recommendations of our Engineering Department in selecting this manufacturer."

Designed for use with Dowtherm "A" and "E", Aroclor 1248, organic heat transfer oils, and other commercially available fluids, standard Union Organic Liquid Heaters (both field erected and shop assembled) can be modified to meet a wide range of job requirements. They can be arranged for firing with most commercial fuels as well as waste fuels in liquid or gaseous form.

For specific information contact your local Riley Stoker Corporation or Union Iron Works office.



UNION IRON WORKS
ERIE, PENNSYLVANIA
A DIVISION OF RILEY STOKER CORP.

Darling Cast Steel Gate Valves

are made in regular and special compositions to match the exact operating conditions found in high pressure refining, pipeline, power plant, and process industry services.

The revolving double disc parallel seat and wedge construction, with plain "no-pocket" discs, prevents accumulation of line scale and sludge. Discs are free to revolve and either disc will work equally well against the pressure.

Built by skilled specialists under the watchful eye of continuous inspection, these cast steel gates will seat perfectly, release easily, operate surely . . . *you can depend on Darling.*

ENGINEERING SERVICE. To meet unusual operating needs, Darling staff engineers will be glad to work with you in developing special valves for your services. Write, wire or phone for detailed information.

DARLING VALVE & MANUFACTURING CO.

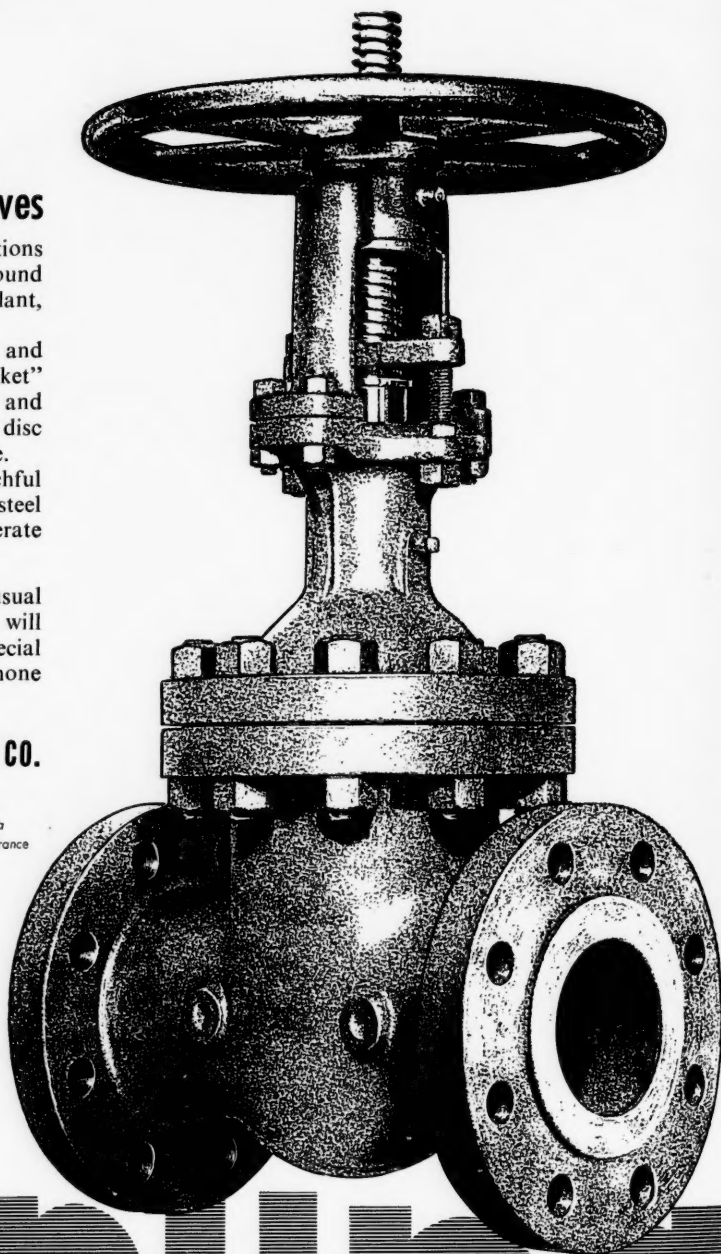
Williamsport 3, Pa.

Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario, Canada
Vannes Darling-France, 23 rue du Commandant Mouchotte, St. Mandé, France

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More evidence of
progress in processing

COWLES DISSOLVER

mixes propellant for

POLARIS

To meet the challenge of producing space-age fuels in big volume for missiles and rockets, including the great Polaris, Aerojet General Corp. engineers have recently completed a change from batch-type mixing to the first continuous process for propellants.

Under their direction Cowles dispersing specialists adapted a giant "COWLES DISSOLVER" to the highly critical operations involved, with noteworthy advantages.

1. Big volume fuel production for large missiles and rockets became practical for first time.
2. Labor costs were cut 80%.
3. Fire and explosion hazards were greatly reduced.
4. Higher quality and greater uniformity in end products were attained.

Cowles also used in first big high energy liquid fuel plant

Because the "COWLES DISSOLVER" provided the best pattern of dispersing materials and compounds to fine particle size in the

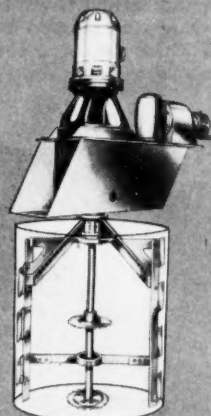
shortest possible time, six of the largest types were specially designed for the Callery Chemical Company plant. Close cooperation between Callery engineers and Cowles application specialists led from a two-stage operation to a single-step method combining the dispersion and reaction stages.

The same unique features of the Cowles that helped make these significant processing advancements possible offer you similar advantages. Cowles dissolving begins where conventional mixing stops, with the patented impeller and "the teeth that make the BIG difference." Ability of the exclusive MPD* (Maximum Power Delivery) drive to deliver over 90% of motor horsepower to the impeller even at slowest speeds enables the operator to have complete control of speed for best results under all conditions.

You get ultimate dispersion faster
—in less space—at less cost.

LET US PROVE IT IN YOUR PLANT AT OUR
RISK! Write today for more complete
information.

SPECIALIZED APPLICATION SERVICE FOR CRITICAL DISPERSIONS



Specially
designed
Cowles impeller
and drive
assembly to
meet unusual
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problem.

Cowles experts have both depth and breadth of experience in critical, high-speed, high shear dispersions unequalled anywhere. Specially designed models for adaptations are available for all purposes—laboratory, pilot plant and full-scale production.

Your inquiry is invited. Perhaps the solution of a problem such as yours is already available from our records. If not, you can be assured of competent assistance in helping you get the right answer.

If your need is urgent or critical, contact the executive nearest you for special attention—

George E. Missbach, General Sales Manager
3330 Peachtree Road, N. E., Atlanta 5, Georgia
Telephone: CEdar 7-1691

H. N. Meyer, Jr., Vice President
Cowles Dissolver Company, Inc.
Cayuga, New York • Telephone: ALbany 3-3214

Hugh F. Purcell, Applications Engineer
Morehouse-Cowles, Inc.
1150 San Fernando Road, Los Angeles 65, California
Telephone: CApital 5-1571



MOREHOUSE-COWLES, INC.
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Los Angeles 65, California

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Wagner® Silicone Rubber Insulated Motors

Power-packed drip-proof polyphase motors that are exceptionally moisture-resistant . . . save you money in lower initial equipment cost for many applications

These are motors that are built to take on and tame the toughest jobs. Big, job-rated motors, available in frames larger than 445U, through 1000 horsepower. Perfect drives that can be used for station auxiliaries, in chemical plants, in rubber and paper mills and in the petroleum industry.

With motor coils completely sealed in a jacket of silicone rubber and housed in a compact, drip-proof enclosure, these Wagner® motors are suitable for use in highly humid atmospheres. They perform perfectly even after long exposure, and at elevated temperatures. Since moisture does not penetrate their tough silicone jackets, they are now used for many installations that once required totally-enclosed motors. Silicone rubber insulated motors cost less

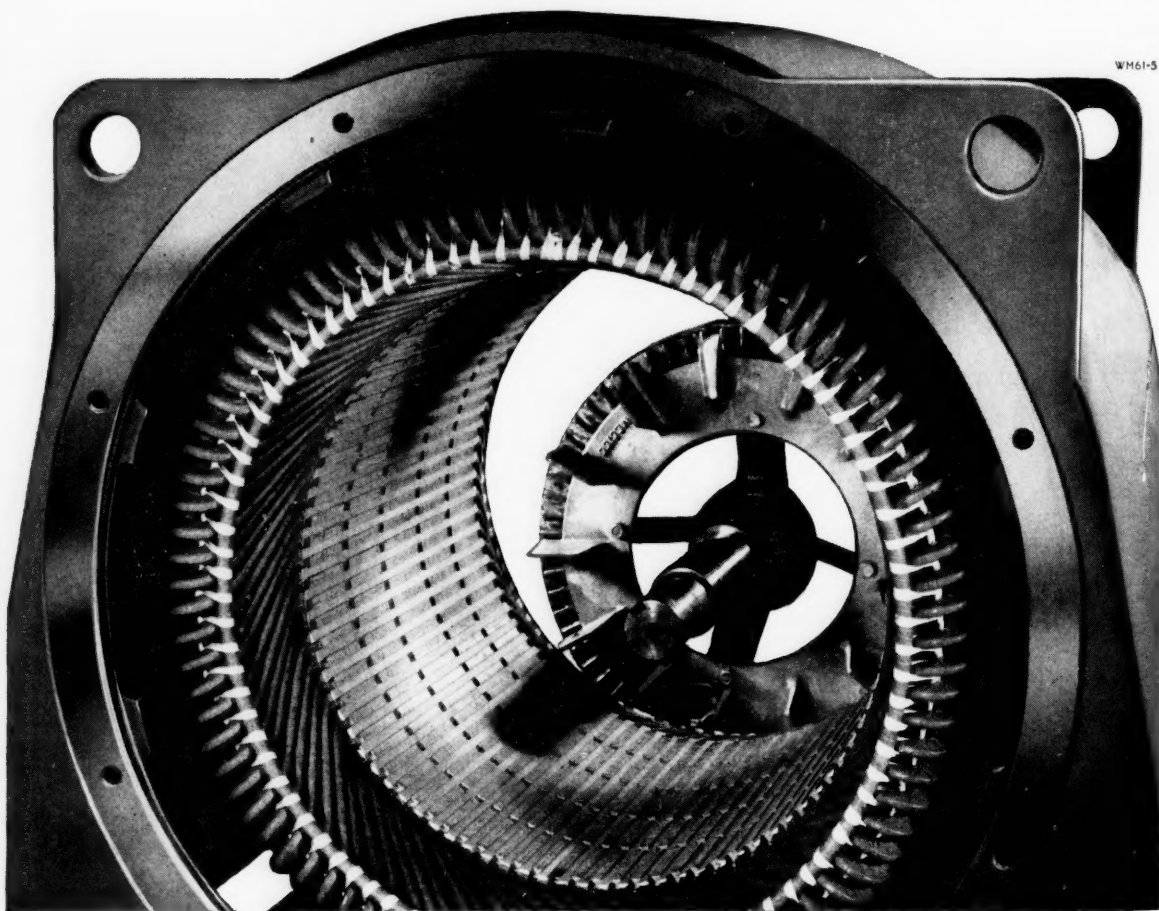
to buy than equivalent totally-enclosed fan cooled motors, since there is no need for expensive enclosures.

But your savings don't stop with initial cost. When rated to match normal load, Wagner silicone rubber insulated motors deliver rated horsepower at top efficiency. They have more overload capacity for temporary overloads . . . reduce downtime while they help keep production levels up.

Like to hear the whole money-saving story of these dependable Wagner silicone rubber insulated motors? Call your Wagner Sales Engineer . . . then settle back for some profitable listening.

Wagner Electric Corporation

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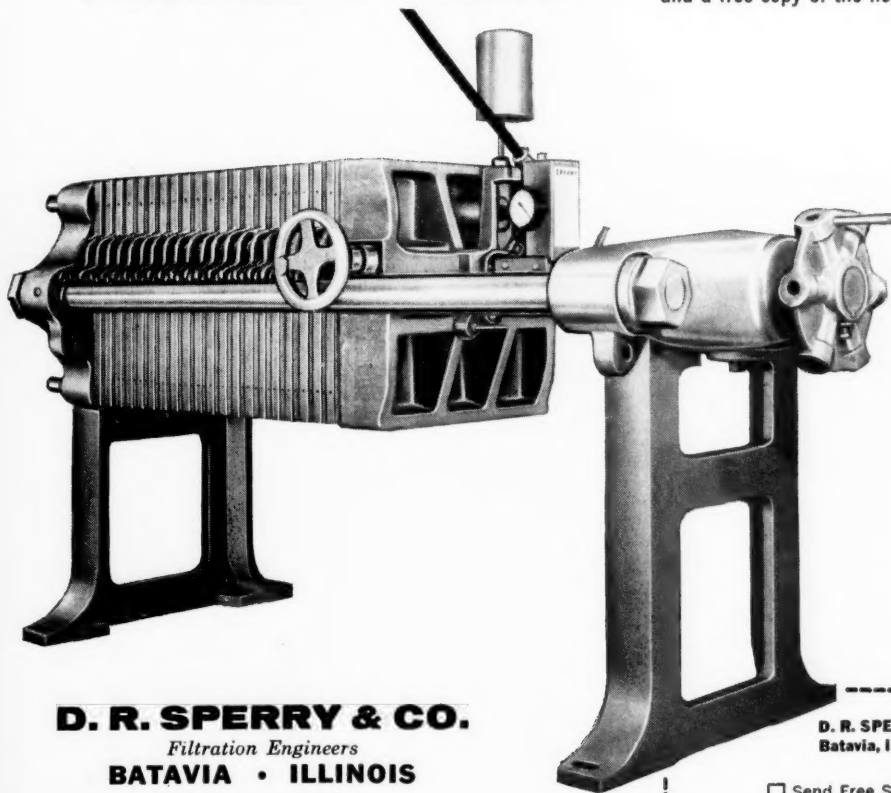
**DAY-TO-DAY VERSATILITY . . .
LONG-RANGE FLEXIBILITY!**

Improve, Expand and Diversify YOUR FILTRATION OPERATIONS WITH A SPERRY FILTER PRESS

You buy a Sperry Filter Press for a specific application. Then you find yourself improving your product—making process changes—adding new products—saving vital production dollars and increasing income.

Sperry stimulates progress of this sort because its plate and frame construction does not limit your production capabilities. A Sperry press can be used for a multitude of applications—go from one chamber to full capacity; handle most filterable mixtures using most media, even paper alone; and easily change products as required by your production schedule.

Consider this flexibility of operation the next time you're looking for a new filter. And remember, a Sperry Filter Press still costs less to own and operate. Write today for details and a free copy of the new Sperry catalog.



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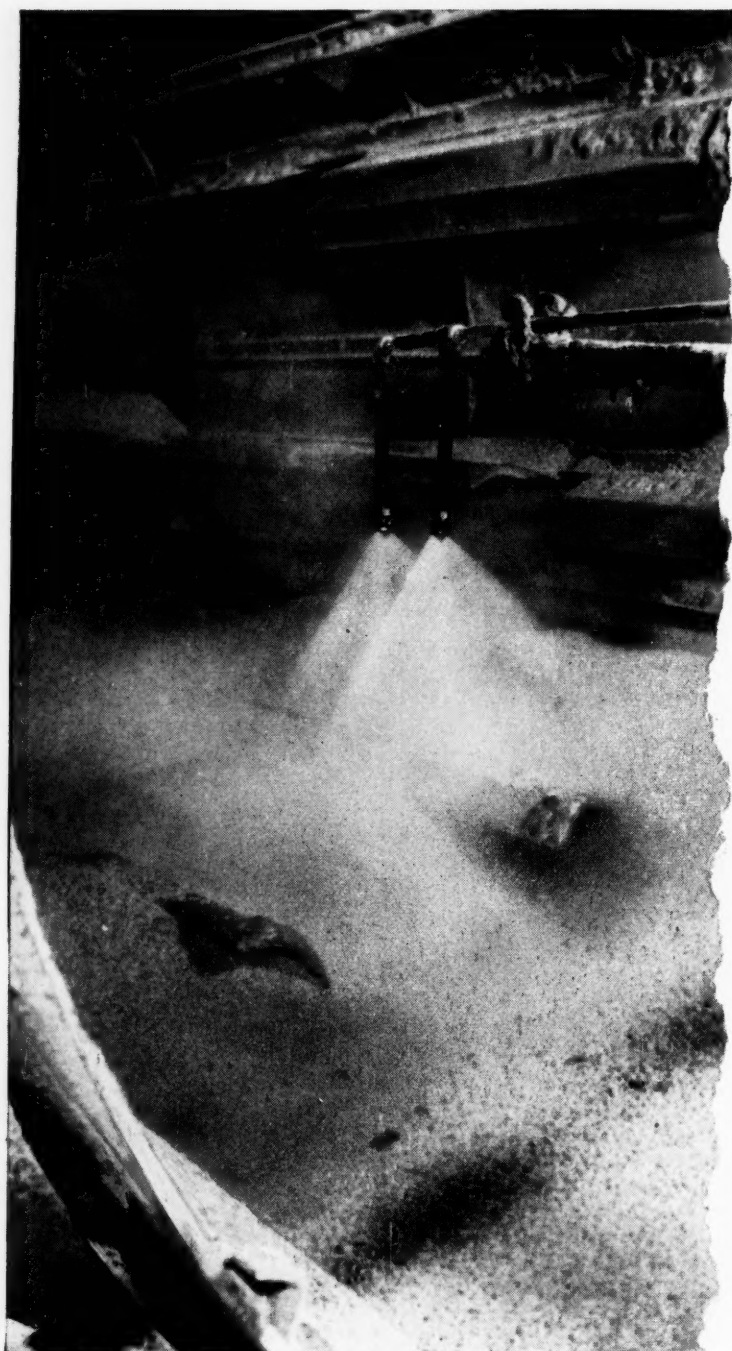
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a bit of ARMOFLO here...



A pound, or less, of Armoflo® compound will condition a ton of various hard-to-handle dry materials. Ap-

plied at an appropriate stage in processing, these liquid conditioners assure free flow of the product in process, function as anti-caking and anti-dusting agents during subsequent handling and storage.

Armoflo compounds may be applied as received, by spraying, dripping or fogging onto the product while it is tumbling in rolling or blending equipment. Armoflos coat each particle with a monomolecular layer that changes hygroscopic surfaces to hydrophobic. They will withstand product heats up to 325° F. and are stable in storage for long periods. Armoflo compounds also provide virtually complete corrosion inhibition for iron and steel processing equipment.

A smoother, faster, more even flow of product results when Armoflos reduce friction between particle surfaces. This lubricating action reduces abrasion and thus reduces "fines" and dust formation.

Armoflos are now being used commercially with a number of products and current testing indicates many more potential applications. The versatility of Armoflo compounds is demonstrated by the following three categories of materials.

FERTILIZERS

Armoflo compounds are effective conditioners for all types of mixed fertilizers—low as well as high analysis grades. The compounds act as anti-dusters on low analysis grades and as anti-dusters and/or anti-cakers in high analysis grades. Armoflos are being used effectively as anti-dusting and anti-caking agents on these typical grades:

Anti-caking and Anti-dusting of High Analysis Grades	Anti-dusting of Low Analysis Grades
0-20-20	0-20-0
5-10-5	3-12-12
5-20-20	3-9-18
7-21-21	3-9-27
7-28-14	4-12-8
10-10-10	4-12-12
12-12-12	5-40-0
15-15-15	8-8-8
17-7-0	10-6-4

Armour Industrial Chemical Company

One of the Armour Chemical Industries • 110 North Wacker Drive, Chicago 6, Illinois

SING
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Dextr
Fluor
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DOES A BIG JOB HERE

SINGLE FERTILIZER SALTS

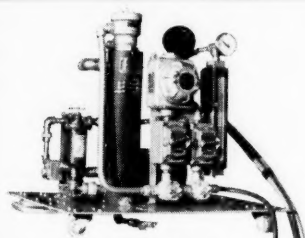
Many of the salts used in formulating mixed fertilizers are hygroscopic and must be conditioned to prevent caking. Armoflo compounds successfully inhibit caking, improve product flow and reduce dust resulting from abrasion. Typical of such Armoflo applications are:

Ammonium chloride	Nitrate of lime
Ammonium sulfate	Potassium chloride
Diammonium phosphate (21-53-0 and 16-48-0)	Potassium nitrate
Manure salts	Potassium sulfate
Monoammonium phosphate	Sodium nitrate
	Urea (prill & crystal)

OTHER MATERIALS

Armoflo compounds likewise do an effective job of helping prevent caking and dusting of various inorganic and organic materials. They function well across a wide pH range from acidic to highly alkaline. The materials listed below, as well as similar products, can be successfully conditioned.

Caustic Soda	Pentachlorophenol
Detergents	Rock salt
Dextrin-urea blends	Sodium bisulfate
Fluorspar	Sodium chlorate
Glues (mixed, powdered)	Sodium metasilicate
Guar gums	Sulfur
Hypochlorites	Sylvite
Insecticides	Thermosetting plastics
Magnesium oxide	Zinc chloride
Metallic soaps	



Armour engineers have designed and built a portable spray unit which demonstrates the effectiveness of Armoflo compounds in the most practical way—right in your plant. This self-contained unit permits conditioner application at several different points of product processing.

Armour Industrial Chemical Company
110 N. Wacker Drive • Chicago 6, Ill.

Please send me:

☐ a copy of your new, revised edition of "ARMOFLO—Armour Anti-dusting and Anti-caking Chemicals."

☐ a sample for conditioning..... (Name of your product).....

Name..... Title.....

Company.....

City..... Zone..... State.....



IF YOU WANT SUPERIOR PRECIPITATOR PERFORMANCE

A precipitator is a lifetime purchase. Once it is installed, you must live with it, whether you like its habits or not. Because of that Buell urges you to look for the following features when you are making the major investment represented by an electric precipitator.

CONSTRUCTION

1. Custom designed, flexible—Buell helps you determine your precipitator needs, then designs a unit specifically for your requirements. Since Buell SF Precipitator sizes change by only 16" increments, you can get exactly the size you need, without compromise of size, space, and cost.

2. Simplified erection—Modern construction and assembly-marked components and a design that facilitates simple installation, make Buell SF Precipitators easy to erect without specialized contractors. Erection is supervised by Buell engineers, to ensure satisfactory operation.

3. Rugged construction—Simple, rugged construction gives you high efficiency, combined with negligible maintenance costs.

GAS FLOW

4. Uniform gas distribution—Buell designs the entire gas system for its precipitators—including connecting flues with adjustable turning vanes if needed. In addition, at the inlet, special field-adjusting baffles ensure uniform flow across the entire face of the unit. Buell has complete laboratory facilities to determine dust or gas flow pattern with specially constructed three dimensional precipitator models.

ELECTRICAL SYSTEM

5. Fool-proof power supply—Buell silicon rectifiers are compact, lightweight, highly efficient. They need no maintenance—another reason for the top performance of a Buell SF Precipitator.

6. Rigid suspension—The emitting frame of a Buell SF Precipitator is hung from four temperature and shock resistant quartz insulators, each sealed in an individual heated compartment. With this rigid system, electrical distance from emitting to collecting electrode is held constant. This produces uniformly high emission for peak efficiency.

7. Peak emission—Exclusive Spiralectrode® emitting electrodes are fixed top and bottom to the emitting frame. Self-tensioned and permanently aligned, they present areas of maximum emission per unit of power input. Top emission can be maintained with maximum applied voltage, because Spiralectrodes eliminate misalignment.

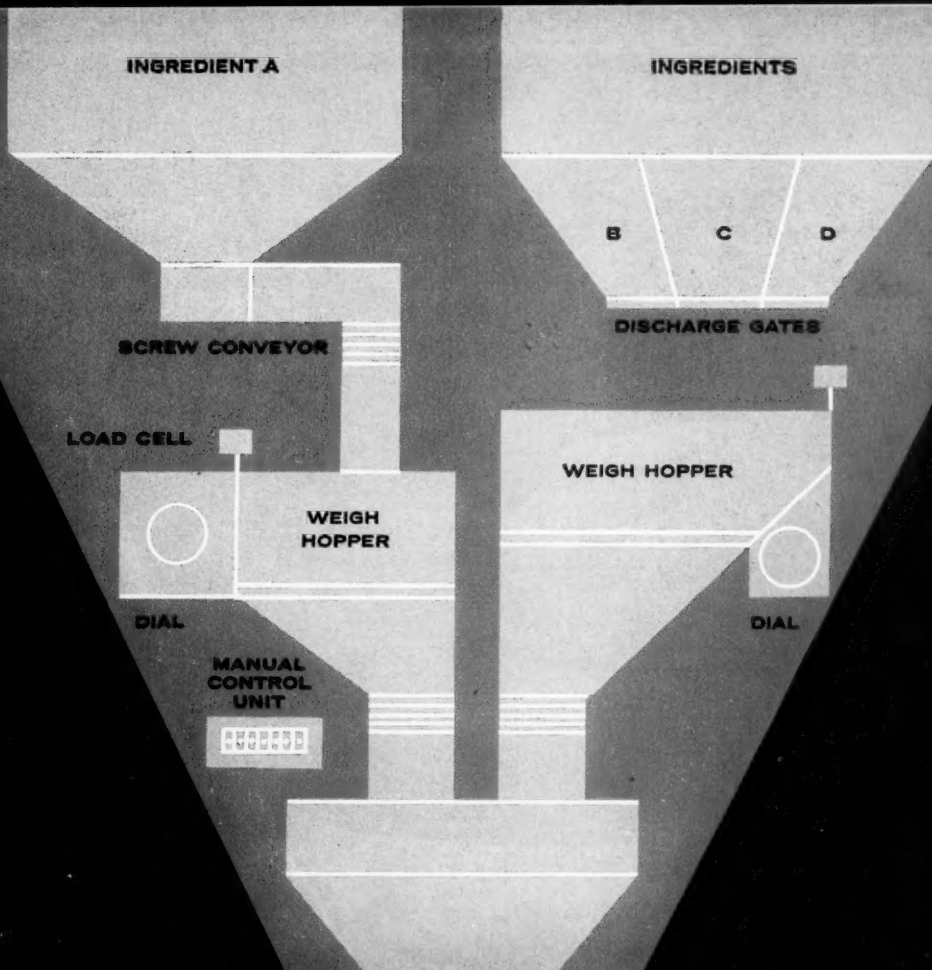
8. Minimum maintenance—The common maintenance headache in most precipitators is frequent replacement of emitting electrodes. Because of rugged suspension and patented electrode design, Buell's 10-year replacement record in this critical area is under 2%.

RAPPING

9. Effective rapping—avoids reentrainment—Buell mechanically raps one row of electrodes at a time, in a continuous cycle. Special pockets in collecting electrodes, and section-by-section rapping in the direction of gas flow, ensure against reentrainment.

You're sure to be pleased with the superior performance and minimum maintenance you'll get with a Buell SF Precipitator! Buell Engineering Co., Inc., Dept. SO-1, 123 William St., New York 38, N. Y. electric precipitators • cyclones • bag collectors • combination systems • classifiers. **Member Industrial Gas Cleaning Institute**





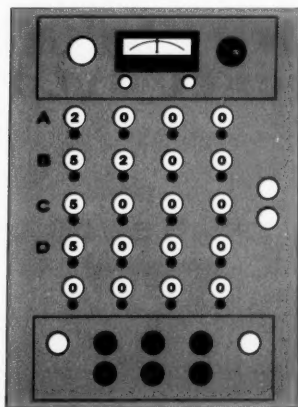
**TIME SAVER...
MONEY SAVER...**

THE NEW FAIRBANKS-MORSE BATCHETRON

One of the latest developments in Fairbanks, Morse's 131 year experience in the weighing business is the *new* Batchetron. It is specifically designed for fast, accurate proportioning of any material that can be pushed, poured or dropped into weigh hoppers. It uses high-speed electronic methods to weigh and batch a number of liquids or solids—in sequence or simultaneously—by means of manual or punched card control.

The Batchetron is easy to set. Its high-speed action assures positive cutoff of ingredient flow. Interlocks prevent incorrect operation... halt operation if anything goes wrong. An improved, electronic weight-sensing system provides long, accurate, trouble-free service with exact batch repeatability every time. At all times control of operations is lightning fast.

The control panel of the Batchetron allows the operator to adjust for hopper tare weights, while pilot lights indicate batching startup, sequence and finish.



Use of the F-M Batchetron results in substantial time and money savings for the chemical and food industries... for concrete and asphalt batching plants... for the many applications where high-speed weighing and proportioning are important. And, of course, the many years of Fairbanks-Morse precision craftsmanship stand behind every Batchetron.

Learn what the Batchetron can do to make *your* operations more profitable.

Write: Fairbanks, Morse & Co.; Electronics Division; 100 Electra Lane, East Station; Yonkers, New York

**ELECTRONICS DIVISION
FAIRBANKS MORSE**
A MAJOR INDUSTRIAL COMPONENT OF
FAIRBANKS WHITNEY



The specialists at General American's Kanigen plant in Sharon, Pennsylvania can deposit an even coating of hard nickel alloy on most ferrous metals in common use. Regardless of how high, wide or heavy the object is, if you can get it to Sharon, we can plate its interior.

Before General American developed Kanigen coating, it was next to impossible to deposit an even nickel plating over very large surfaces or on many complex shapes. Since Kanigen nickel plating is purely a chemical

**IF YOU CAN
SHIP IT
WE CAN PLATE IT!
NO MATTER WHAT THE SIZE
OR SHAPE OF YOUR PRODUCT,
IT CAN BE COATED BETTER
WITH KANIGEN®
NICKEL ALLOY**

process involving no electric current, it works equally well on simple or complex shapes and on small or large surfaces. Thickness uniformity of the coating is independent of part complexity or size.

Only General American and its authorized licensees around the world can show you how Kanigen coating may improve your product. The Kanigen process is protected by more than 30 separate patents. For detailed technical literature, write for bulletin No. 561.

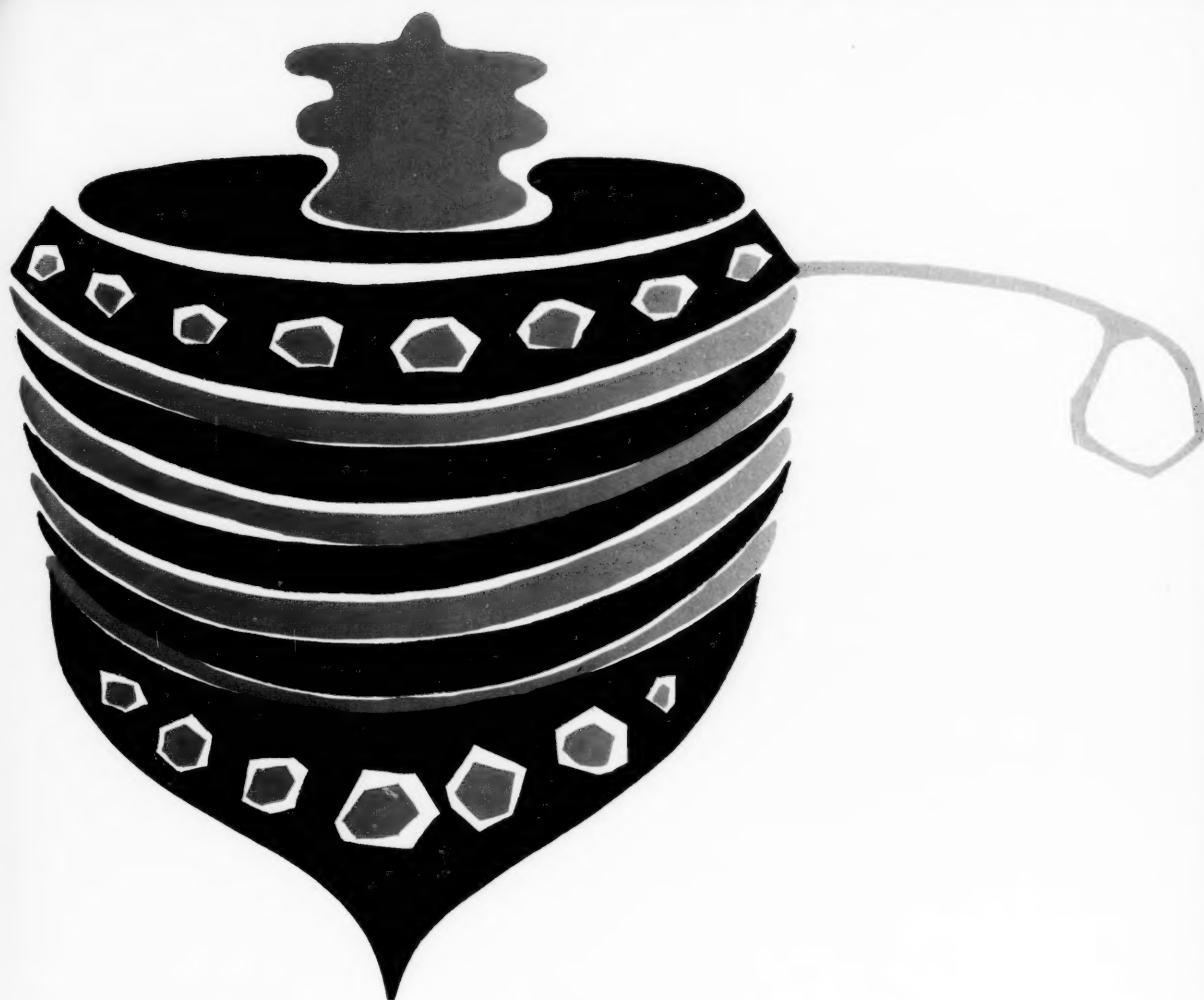
Kanigen Division

GENERAL AMERICAN TRANSPORTATION CORPORATION

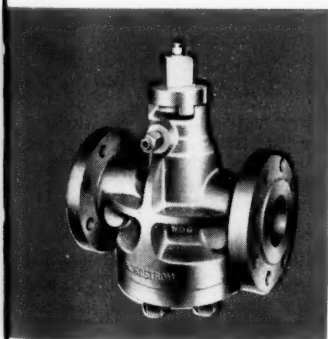
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easy to turn: The longest time in the world can be the time it takes to close a valve . . . when you have to close it in a hurry. The sure, easy quarter turn closure of Rockwell-Nordstrom valves saves seconds, even minutes. And you'll save hours of maintenance time on seat replacement with the Rockwell-Nordstrom's sealant system, which replaces the valve's seat from outside. The longer life of these valves—six, eight, even ten times ordinary types—saves days of replacement labor. Add up these times, multiply by the valves in your plant, then again by your labor rate: the result may amaze you. We'll be happy to send you complete information.



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Rockwell International, S.A.
81 Rue de la Servette
Geneva, Switzerland

Please send me Bulletin V-618.

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Company _____

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Some Straight Talk On Steam Trap Capacity

...or pulling away the curtain of confusion
that surrounds steam trap capacity ratings.

Unfortunately, for the steam trap buyer, the subject of steam trap capacity has become cloudy and confused by a landslide of claims, counter-claims and inconsistent "standards" for measurement. So let's take a cold hard look at this subject so vital to the efficient operation of your plant.

What Determines Steam Trap Capacity?

There are three factors that determine the capacity of a steam trap:

1. The area of the orifice.
2. The density of the condensate.
3. The pressure differential across the trap.

Let's take a closer look at each of these:

Area of orifice is usually specified by the trap manufacturer or can be calculated from the diameter. Nothing complicated here.

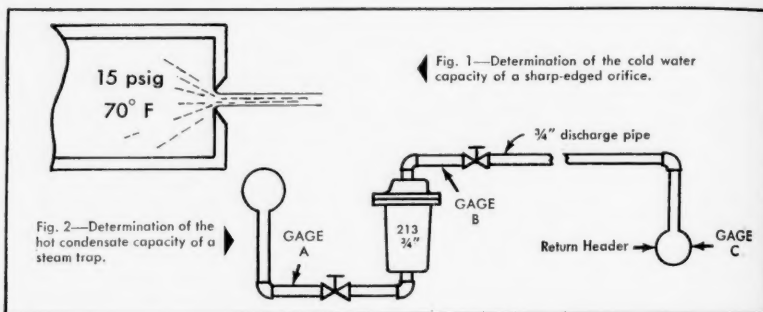
Density of condensate depends on temperature. A cubic foot of cold water weighs 62.4 lbs. At 250° F. or 15 psi, it weighs less than 59 lbs. This is important. Don't overlook it.

Pressure differential across the trap is most significant. And it is complicated by the many factors that affect it, such as:

1. Pressure drop between unit drained and the trap when the trap valve is open.
2. Distance the trap valve is moved from the valve seat.
3. Back pressure on the trap with orifice closed; i.e., return header pressure.
4. Increase in back pressure produced by condensate and flash steam flowing in the discharge line. This in turn is affected by the diameter and length of the discharge line, plus friction caused by valves and fittings.

Orifice Capacity Vs. Steam Trap Capacity

Figure 1 shows a 1/2" diameter sharp-edged orifice at the end of a pipe filled with cold water at 15 lbs. pressure. The capacity of this orifice, using a .61 coefficient of flow would be 8,800 lbs. per hr. Now, would this 1/2" orifice if used in a 3/4" steam trap installed as shown in Figure 2 provide the trap with a continuous discharge capacity of 8,800 lbs. of hot condensate per hour? The answer is



"no". And here are some of the reasons why:

Density of condensate. As pointed out above, cold water weighs 62.4 lbs. per cu. ft. At 15 lbs. pressure and 250° F. water weighs less than 59 lbs. per cu. ft. This difference in density alone reduces the lbs. per hour capacity of the orifice by over 5%.

Pressure differential across the trap. With the trap valve closed we have a static pressure differential of 15 psi. The trap valve must be able to open against this pressure. However, this is not the pressure differential that will determine the capacity of the trap valve.

The 3/4" discharge line will be full of a mixture of flash steam and condensate. To keep this mixture flowing from the trap outlet to the return line requires a pressure differential. In actual capacity tests run as shown in Figure 2 Gage B at the trap outlet registered 11 lbs. back pressure. Thus the true pressure differential across the trap was about 4 lbs. Under these conditions the measured capacity of the trap was 4,340 lbs./hr. or just about half of the capacity of the 1/2" orifice for cold water.

How Armstrong Determines Capacity Ratings

Armstrong trap capacity ratings are based on hundreds of tests under actual operating conditions. In these tests, the condensate used was at the steam temperature corresponding to the test pressure. Thus, the capacities determined take into account the pressure drop that occurs when the trap orifice opens and the choking effect and back pressure of the flash steam. Actual installation hook-

ups were used so that pipe friction in both inlet and discharge lines as well was reflected in the results.

Let's go back to the example cited above and in Figure 2. The trap referred to is an Armstrong No. 213. While it did test out at 4,340 lbs. per hour for a static pressure differential of 15 psi, it is rated in the catalog at only 3900 lbs. per hour for this pressure—just to be on the safe side.

For the trap buyer, this means that Armstrong Steam Trap capacities are based on handling condensate at steam temperature for the stated static steam pressure differential under actual working conditions.

Capacity ratings which don't take into account all of the variables will be misleading and may lead to the selection of undersized traps. So whenever you specify or buy traps be sure that the capacity ratings you work from are realistic. One way to be sure is to select Armstrong Traps with *guaranteed* capacity ratings.

* * *

Additional information on trap capacity ratings, plus data on how to correctly size, install and maintain steam traps for any pressure, any temperature and any load, are presented in the 48-page Armstrong Steam Trap Book. Ask your local Armstrong Representative for a copy or write:

Armstrong Machine Works
8589 Maple Street
Three Rivers, Michigan



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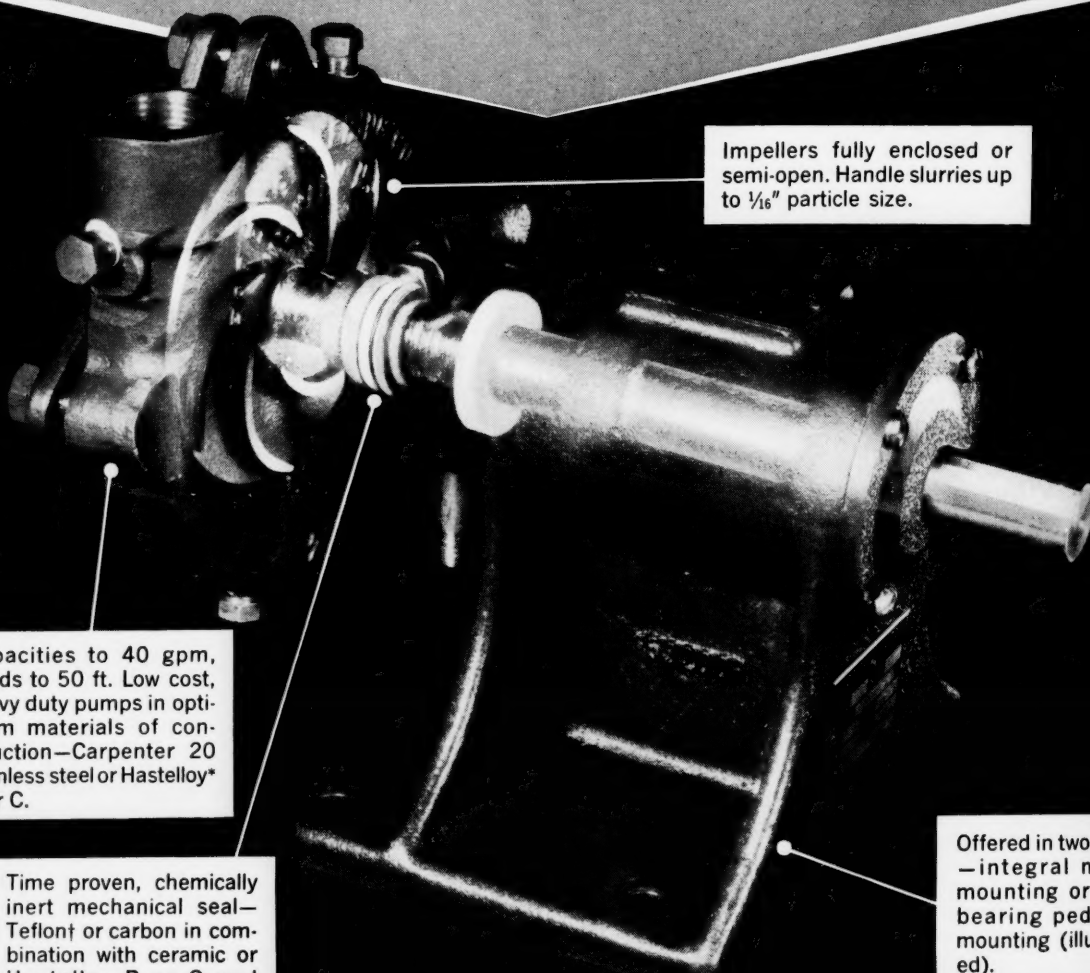
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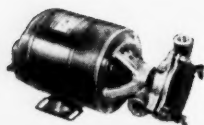
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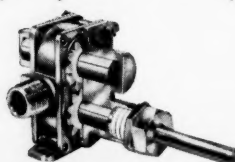
*Union Carbide Trademark. †du Pont Trademark.



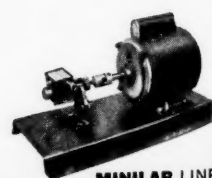
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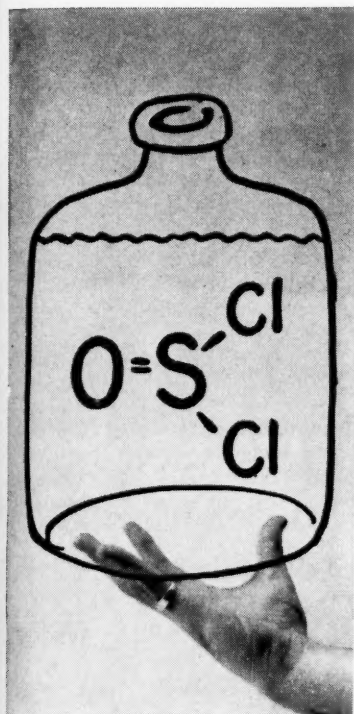
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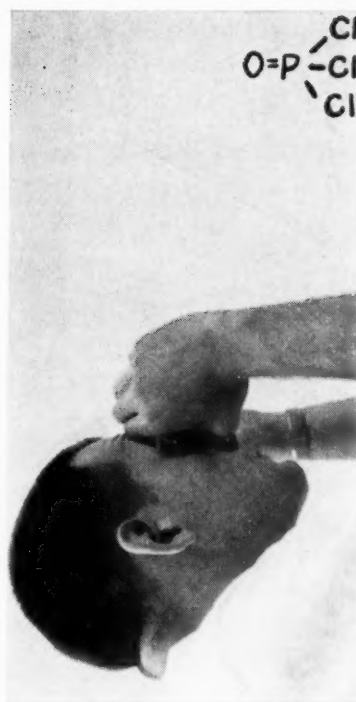
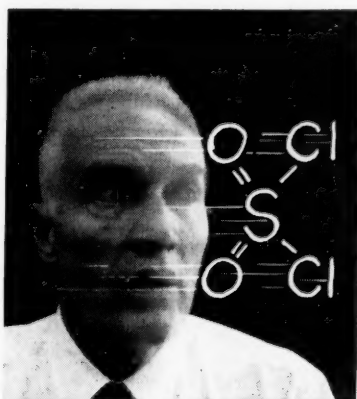
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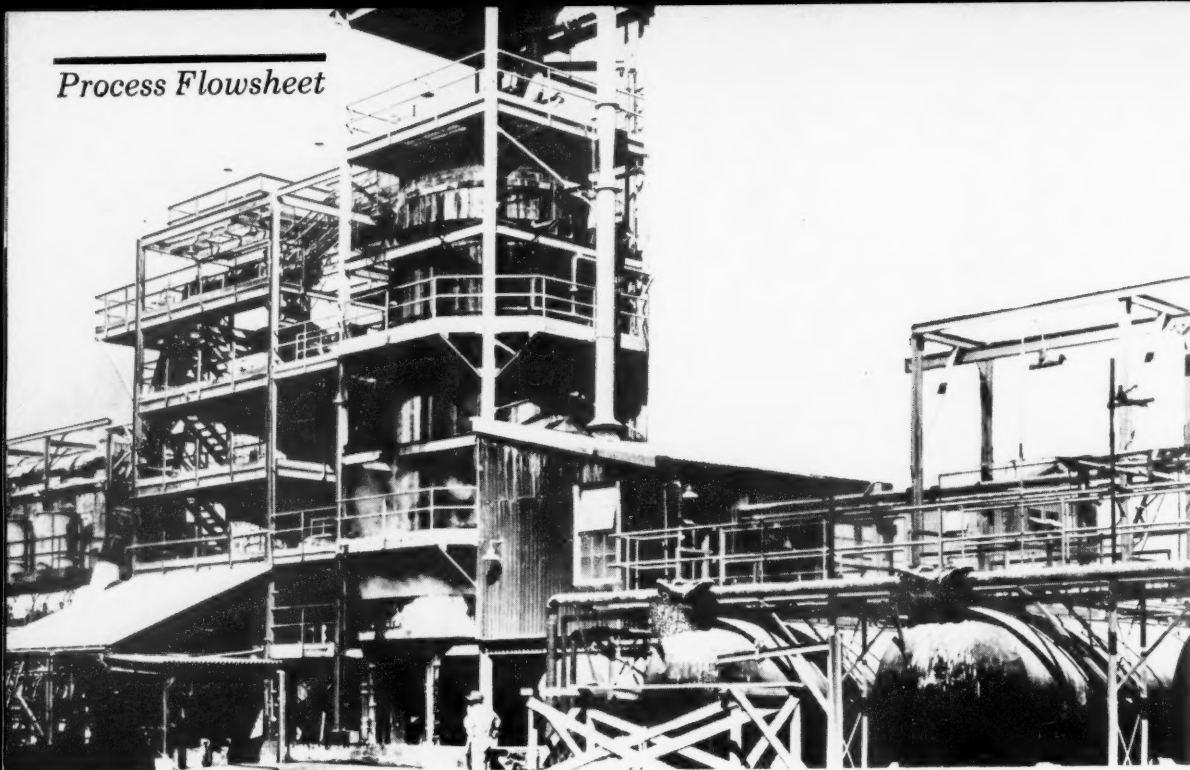
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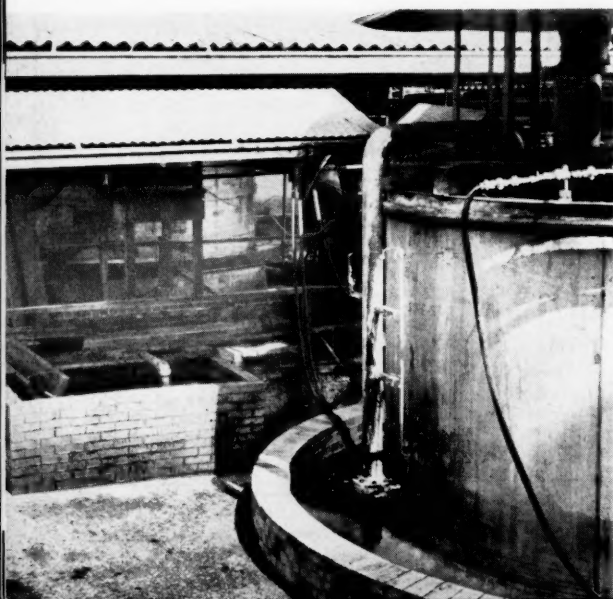


TVA added more cooling capacity to this former conventional-furnace-acid plant, now makes super acid in it.

Unfold flowsheet

Superphosphoric Acid

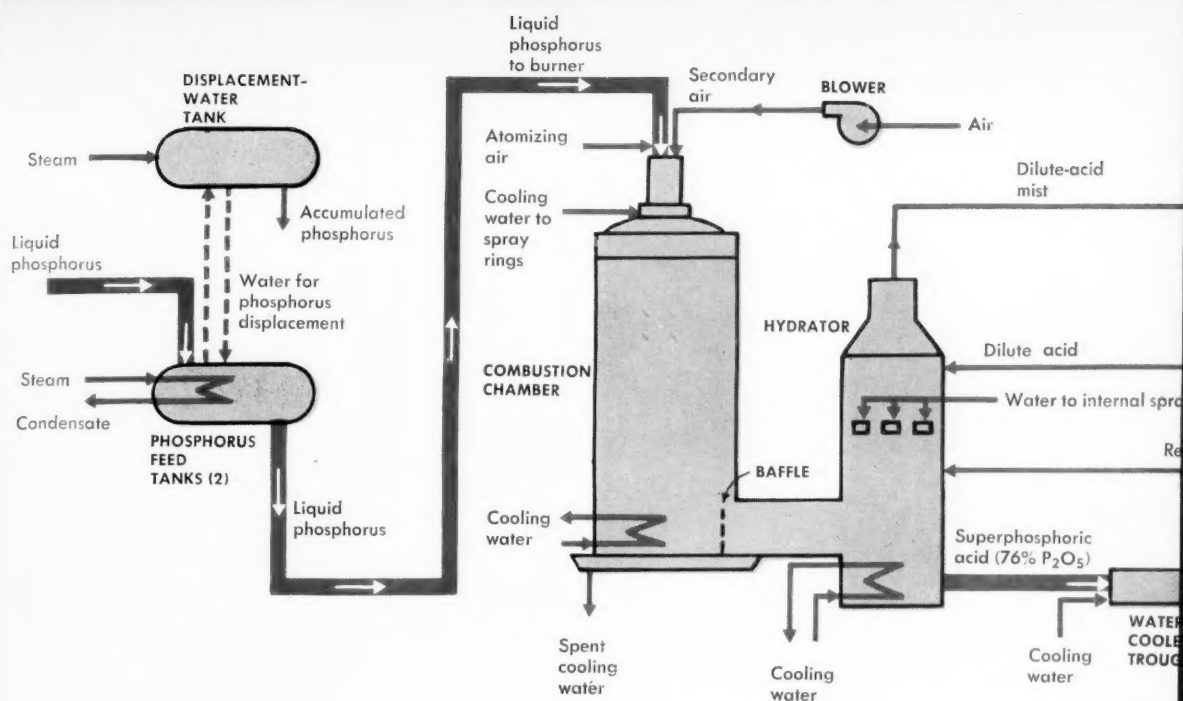
Paves Way for Fertilizer Shift



A driving force behind the current move to concentrated fertilizers is superphosphoric acid, a 76% P_2O_5 product that can be made by producers of ordinary furnace acid.

M. M. STRIPLIN, JR. *Tennessee Valley Authority*

Acid cooler, right, has not only cooling coils but also a water spray that removes heat from the vessel exterior. Acid sump is in center background.



A new, strong phosphoric acid, superphosphoric acid, is the key to much of today's mushrooming trend to higher-analysis phosphate fertilizers.

Often called super acid, the product contains 76% P_2O_5 and is equivalent to 105% orthophosphoric acid (H_3PO_4). Hence, it bears much the same relationship to ordinary, 75% H_3PO_4 —which contains 54% P_2O_5 —as oleum to sulfuric acid.

Super acid is less corrosive than ordinary orthophosphoric, and more economical to store and handle because of its higher P_2O_5 content. And it readily converts to ordinary 75% H_3PO_4 when mixed with sufficient water.

The unusual properties of this new acid are partly due to the presence of polyphosphoric acids, including the pyro ($H_4P_2O_7$), tri ($H_5P_3O_{10}$) and tetra ($H_6P_4O_{13}$) forms. (Conventional 75% acid, on the other hand, contains only the ortho form.) Although its P_2O_5 content is between those of 100% H_3PO_4 and pyrophosphoric acid, both solids at room temperature, the super acid is fluid.

Besides its role as a basic fertilizers ingredient, super acid has important advantages as a sequestrant for impurities and trace elements in liquid fertilizers, for metal treating, and as a catalyst and dehydrating agent in organic reactions. Among the new plant foods based on superphosphoric acid are ammonium polyphosphate (*Chem.*

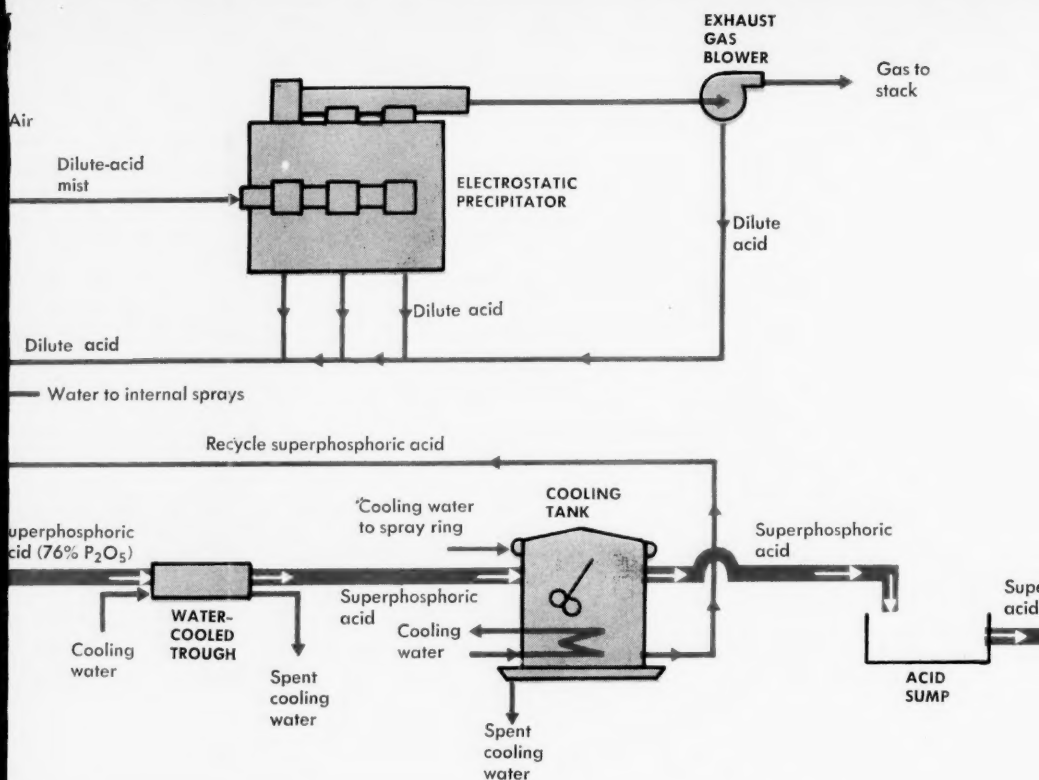
Eng., May 15, 1961, p. 68), 54%- P_2O_5 superphosphate, and 10-34-0 grade liquid fertilizer. And, solids-free liquid fertilizers that are easy to store and apply are now possible from impure wet-process phosphoric acid by the addition of super acid or 10-34-0 solution.

TVA pioneered the development of super acid. First production was on a trial basis in 1956, and industry interest in the new product increased rapidly once information on its manufacture and unique properties was made available by TVA.

► **Production**—Usually, conventional furnace-acid plants with some alterations or additions can produce the new acid. For full-scale production, TVA rehabilitated one of its own conventional plants at Wilson Dam, Ala., and installed additional cooling facilities in the unit.

In making super acid, phosphorus is burned with air under the same conditions as for the production of acid of ordinary concentration. The big difference occurs in the hydrator, where the combustion gas is cooled with water or dilute acid sprays, and phosphorus pentoxide vapor hydrolyzes to form phosphoric acid mist.

While it is possible to make the super acid, as was done initially, merely by decreasing the amount of water sprayed into the hydrator, this procedure causes higher temperatures for a given



P_2O_5 superphosphoric acid. And, it is easy to store pure wet-product of super acid

of super acid. In 1956, and product increased manufacture and sale by TVA.

al furnace-acid conditions can produce, TVA additional plants at additional cooling

phosphorus is burned as for the concentration. The hydrator, where the or dilute acid vapor hydro-

super acid, as decreasing the hydrator, this res for a given

phosphorus burning rate, and thus corrosion is increased. It is advantageous to prevent this temperature increase by providing indirect cooling to compensate for less evaporation.

Indirect cooling can be furnished by tubular gas coolers between the combustion chamber and the hydrator, but the best procedure is to cool the product acid and recycle some of it to atomizing nozzles in the hydrator.

► **At Wilson Dam**—The improved TVA plant produces about $5\frac{1}{4}$ tons/hr. of super acid. Its combustion chamber is water-cooled and made of graphite. Phosphorus burning rate is around 3,500 lb./hr.

Gas leaves this chamber at 1,120 F. and enters a carbon-lined brick hydrator, where it rises against water, dilute acid and 180 gpm. of recycled product acid. Roughly half the P_2O_5 drops out in this vessel as super acid.

The rest leaves overhead as a mist at 200 F., is collected as less concentrated acid in an electrostatic precipitator. (Other types of mist-collecting equipment, such as a venturi scrubber or packed tower, can be used for this step.) The dilute acid is sprayed back into the hydrator, and effluent gas from the precipitator, at 150 F., passes through a blower to a stack.

Meanwhile, super acid flows from the hydrator

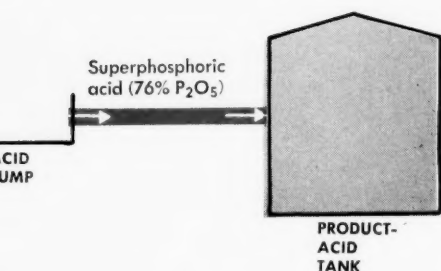
at about 300 F. to a carbon stainless steel through which cooling vessel exterior is cool

The acid is agitated and to maintain a uniform 200 F. Product acid the stream for recycle to the hydrator.

The plant employs bottom of the combustion where pools of cooled to protect the equipment minimize acid leakage the electrical conducting leaving the plant show the water, so that rep

► **Alternates**—Combustion carried out separately, chamber of the interior, refractory-brick-lined steel combustion chambers may be graphite steel, and used as packed

Cooling is provided of unlined stainless steel recycling cooled super corrosion is avoided.



300 F. to a tank made of Type 316 low-alloy stainless steel. This tank contains coils through which cooling water circulates, and the exterior is cooled by a water film as well. The acid is agitated to improve heat transfer and to maintain a uniform temperature of about 250 F. Product acid overflows to a sump, and the acid for recycle is withdrawn and pumped back to the hydrator.

The plant employs water-cooled coils in the bottom of the combustion chamber and hydrator, and the coils of cooled, viscous acid are maintained at 250 F. at the equipment, seal any cracks and prevent acid leakage. Regular measurement of the electrical conductivity of the cooling water at the plant shows when acid is leaking into the water, so that repairs can be made.

Uses—Combustion and hydration can be carried out separately as described, or in a single unit of the internal wetted-wall type. Graphite, refractory-brick-lined steel or unlined stainless steel combustion chambers may be used. Hydrators can be graphite, carbon or unlined stainless steel and used as packed or spray towers.

Corrosion is provided by water films or, in the case of unlined stainless steel, by a water jacket. By cooling super acid to the hydrator, severe corrosion is avoided.

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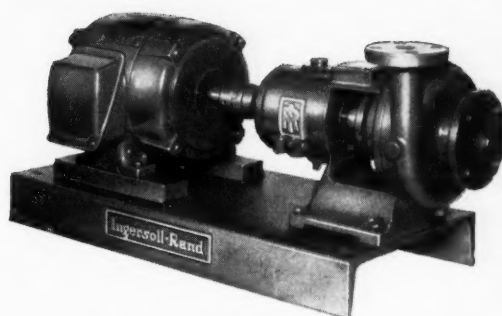
INGERSOLL-RAND CHEMICAL PUMPS

This new line of pumps consists of ten basic units from 3/4 inch to 4-inch discharge size with horsepower ranging from 1/4 through 50. Capacities reach 1000 gallons per minute and heads to 240 feet.

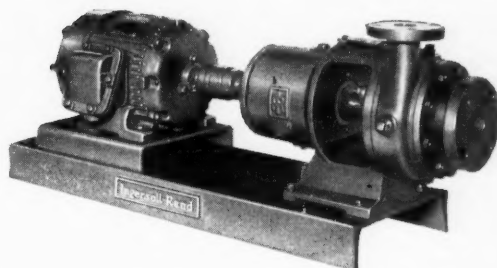
Each of these cradle-mounted units is available in either ferrous, alloy or non-ferrous materials and can be driven through a flexible coupling, gear or belt and sheave arrangement.

Available features include standard or water-cooled stuffing box, packed box or mechanical seals, constant level oilers and interchangeability of parts in units of the same size in various materials.

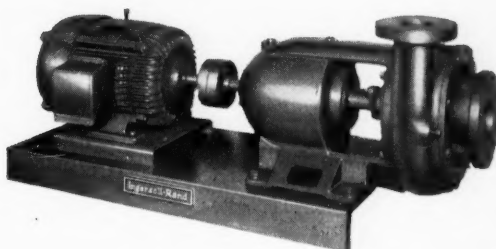
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Class CORV, 3/4 and 1-inch discharge
1/4 to 7 1/2 hp ... gpm to 65 ... heads to 125 ft.



Class CORV/CORVH, 1 1/2 and 2-inch discharge
1/3 to 25 hp ... gpm to 350 ... heads to 240 ft.



Class CORVL, 1 1/2, 2, 3 and 4-inch discharge
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How RAYMOND Flash Drying

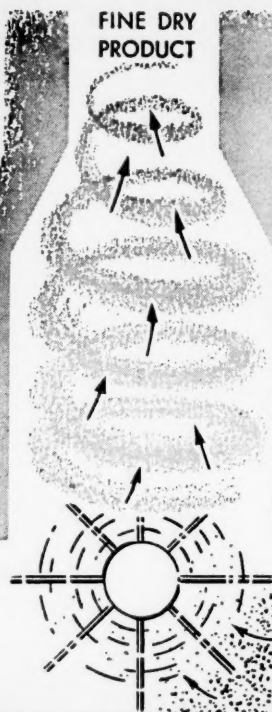
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Raymond Division

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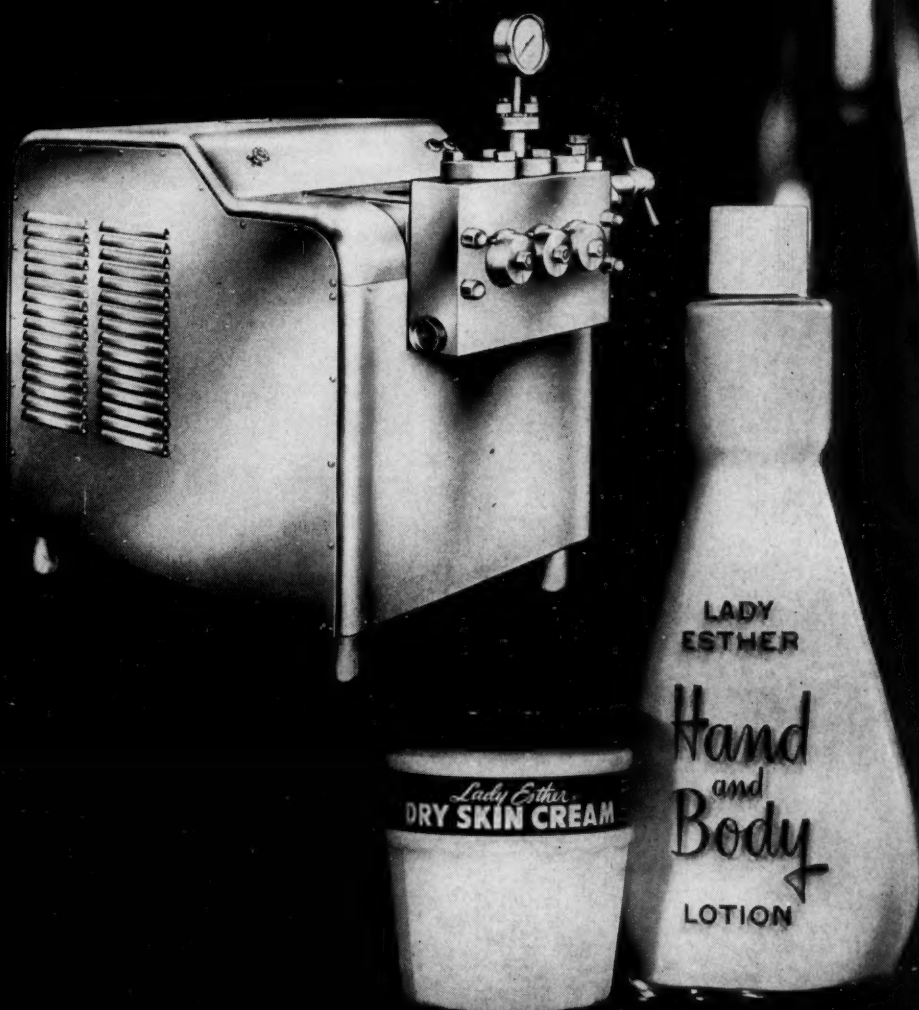
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Lady Esther Dry Skin Cream and Hand and Body Lotion must be as smooth, as creamy, and as evenly textured as the skin it cares for. And the complexion — the nature — of Lady Esther creams is cared for by Cherry-Burrell homogenizers. They make sure it is evenly textured, intimately blended, and smooth enough to complement the most delicate skin.

Cherry-Burrell homogenizers subject the cream to a strenuous shearing action. Explode it from 30 to 300 feet per second. And while increasing its velocity tenfold,

change its direction abruptly 90°. The result: Lady Esther cosmetic creams and lotions that are so smooth and pleasant to use they generate repeat sales.

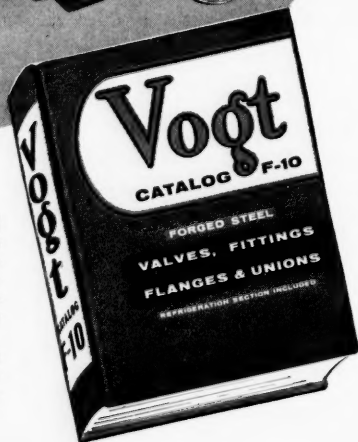
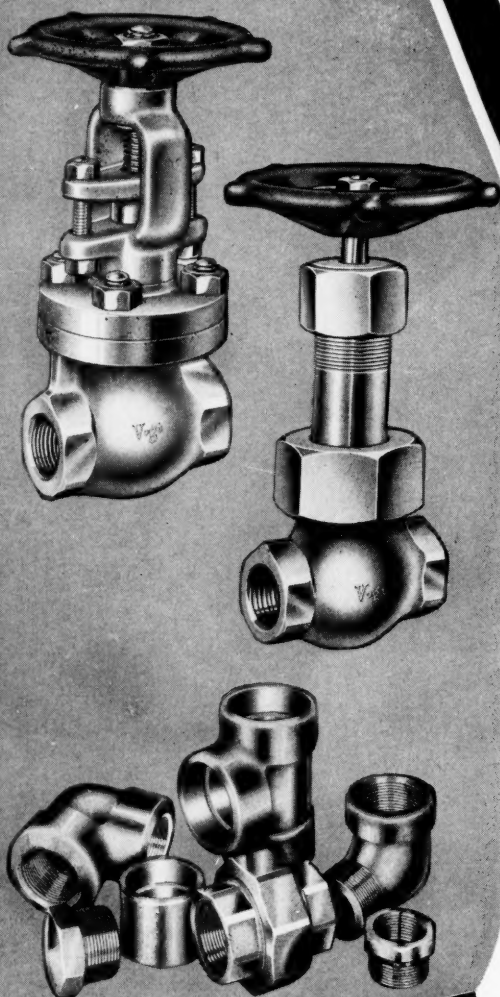
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How to Design Sedimentation Systems From Laboratory Data

Apparatus made from rigid plastic tubing gives basic data for designing clarifiers that will remove low suspended-solids concentrations. Device defines relationship between solids removal, and surface loading and detention time.

RICHARD A. CONWAY and VICTOR H. EDWARDS*
Union Carbide Chemicals Co.

This article presents a practical method for collecting and correlating the basic data needed to size facilities for removing low concentrations of suspended flocculent solids.

Sedimentation (gravitation settling) is often the most economical way to separate finely divided suspended solids from a liquid. In addition to its wide application in chemical and metallurgical processes, sedimentation is the most frequently used means to reduce pollution in industrial waste waters. If sedimentation equipment is designed without experimental studies on the particular suspension, unsatisfactory performance will often result.

In a recent article,¹ Anderson and Sparkman reviewed the fundamental concepts of clarifier design. The laboratory-scale tests that they describe for collecting clarifier design data are particularly applicable to heavy suspensions where design is based upon the settling rate of the solids-liquid interface that forms at the surface.

For lighter suspensions (0.01 to 1% by weight) where an interface does not form, the average settling velocities of the particles are the basis for design. In the case of free-settling discrete particles, this settling velocity can be calculated.¹ Flocculent particles, however, undergo major changes in size, shape

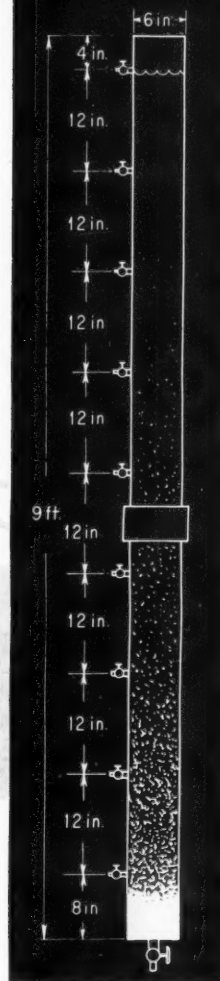
and weight during settling that render impractical the use of formulas alone to determine settling rates. The setting rates must be determined experimentally.

O'Conner and Eckenfelder have developed a procedure for determining these design data in the laboratory.² The techniques outlined in this article are based upon their approach, but a simplified means for correlating the myriad of data is presented. Also, we shall describe apparatus and procedures in detail.

Test Cylinder Provides Laboratory Data

The laboratory studies consisted essentially of holding the suspension to be clarified under quiescent conditions in a test cylinder, and periodically determining the solids concentration at various depths. The suspension used was waste water from a large chemical plant containing about 0.03% suspended solids.

The 9-ft. test cylinder, above, was made from rigid plastic tubing, which was easy to fabricate and reduced any heat transfer caused by slight differences between liquid and air temperatures. The 6-in. di-



* Now at Rice University, Houston, Tex.

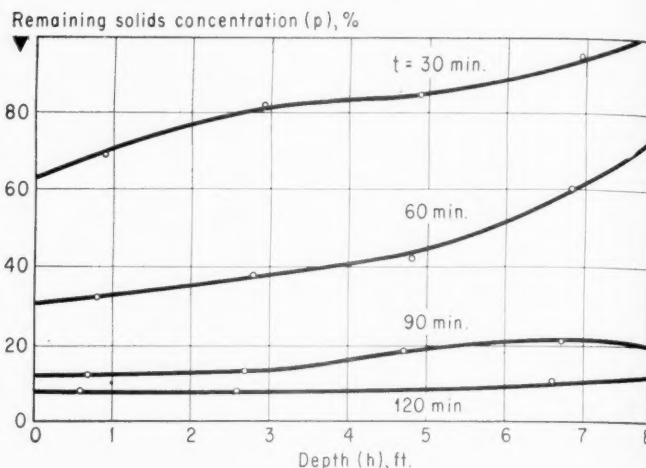
Presented at the annual meeting of the Industrial Section, Texas Water and Sewage Works Assoc., Houston, Tex., March 30-31, 1961

Typical settling-rate data from laboratory (Table I) . . .

Settling Period, Min.	Depth Sampled, Ft.*	Suspended Solids Content Concentration, Mg./L.	Remaining %†
0	1.0	325	100
0	3.0	326	
0	5.0	319	
0	7.0	319	
30	0.9	224	70
30	2.9	265	82
30	4.9	266	83
30	6.9	303	94
60	0.8	103	32
60	2.8	121	38
60	4.8	134	42
60	6.8	194	60
90	0.7	38	12
90	2.7	42	13
90	4.7	58	18
90	6.7	63	20
120	0.6	27	8
120	2.6	26	8
120	4.6	29	9
120	6.6	33	10

* Each set of samples reduced the water depth about 0.1 ft.
† Calculated from: (final conc./initial conc.) \times 100

. . . are plotted as a family of curves at different settling times (Fig. 1) . . .



ameter minimized the effects of both drag and minor thermal currents on the settling. A small bench supported the cylinder, which was structurally stable when securely clamped to a laboratory grid. The joint between tube sections was reinforced with a 2-in. flat plastic belt, heated and bent to fit. An ethylene dichloride solution of plastic chips was used for adhesion.

Before each clarification run, we adjusted the temperature of about 15 gal. of freshly collected waste water to the ambient temperature in the laboratory, about 24 C. This adjustment, which reduced thermal currents to a tolerable level, was carried out in a vat containing mixing facilities and coils through which hot or cold water passed. Also at this time, we made any desired modification of the waste, such as pH adjustment or coagulant addition.

After it had reached the desired temperature, the waste was pumped into the clarification cylinder through the bottom drain line. Four 100-ml. samples were then taken at evenly spaced depths from the $\frac{1}{4}$ -in. sampling ports, to define the initial solids concentration. The unit was resampled in the same manner at $\frac{1}{2}$ -hr. intervals during a 2-hr. settling period.

We used the membrane-filter technique developed by Englebrecht and McKinney⁸ for all suspended solids determinations because it is more efficient for a large number of samples than the commonly used Gooch crucible method.

Most clarification studies involving industrial waste waters require that the relationship between solids removal and biochemical oxygen demand (BOD) be defined. This can be done by determining the BOD of both the unsettled mixture and the filtrate from this mixture. The difference between the two is the BOD concentration due to the presence of the solids. Reduction in solids concentration should cause an equivalent percentage reduction in this BOD increment, if

all the particles have about the same composition.

How to Correlate the Data

The percentage of initial suspended solids concentration remaining at each sample time and depth was used to find the desired relationship between removal efficiency and allowable clarifier surface loading and depth.

Table I compiles the data collected during a typical clarification run, and Fig. 1 is a plot illustrating the correlation procedure. When the family of curves in Fig. 1 is graphically integrated to give the curves in Fig. 2, the data become available in a form suitable for direct development of design criteria. The box below Fig. 2 illustrates this integration method.

To better understand the reason for integration, suppose that a curve in Fig. 1 for any time t is divided into very small intervals. The average coordinates of the curve in the n th interval would be h_n and p_n , where h_n is the depth and p_n is the remaining percentage of initial suspended solids. The expression p_n was originally determined using the equation

$$p_n = (c_n/c_0) \times 100$$

where c_n is the concentration of suspended solids in the n th interval, and c_0 is the initial concentration of suspended solids in the mixture.

Now consider the test cylinder at time t . If the cross-sectional area of the test cylinder is called A , and the n th incremental horizontal section of the cylinder has a thickness of dh_n , the weight of suspended solids in the n th interval dW_n would be

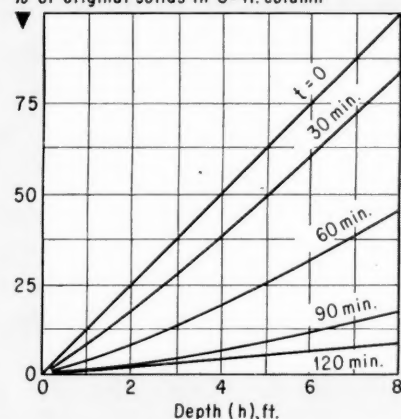
$$dW_n = c_n A dh_n \text{ and } dW_n = (c_0 p_n / 100) A dh_n$$

Therefore, the total weight of suspended solids above any depth h would be

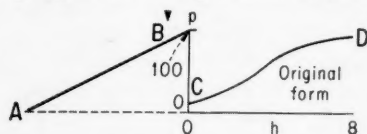
$$W_t = \sum_{h=0}^h dW_n$$

... and then integrated graphically
(Fig. 2) to give data for ...

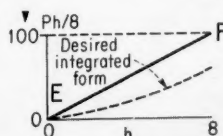
Cumulative solids content in column (Ph/8),
% of original solids in 8-ft. column



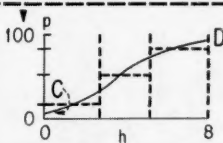
Use this graphical integration method



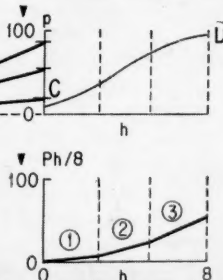
1. Locate reference point A for integration of curve CD by constructing line AB at the same slope as line EF.



2. Divide curve CD vertically into segments of about equal slope. Bisect each segment horizontally, keeping the areas of the two "triangles" equal.



3. Draw reference lines by connecting A with intersections of above horizontal lines with the vertical axis. Construct the integrated form of CD by keeping the slope within each segment equal to the slope of its reference line.



$$W_t = \sum_{h=0}^h (c_o p_n / 100) A dh_n$$

$$W_t = \frac{Ac_o}{100} \int_0^h p dh$$

... relationship between overflow
rate and solids removal (Table II)

Depth, Ft.	Settling Period, Min.	Overflow Rate, Gal./Day/ Sq. Ft.*	Remaining Solids Content, Ph/8**	Solids Removal, %†
4	30	1,440	39	22
4	60	720	19	62
4	90	480	7.5	85
4	120	360	4.3	91
6	30	2,160	61	19
6	60	1,080	31	59
6	90	720	12	84
6	120	540	6.8	91
8	30	2,880	85	15
8	60	1,440	45	55
8	90	960	18	82
8	120	720	9.0	91

* Calculated from: 10,800 (depth, ft.)/(settling period, min.).

** Data from Fig. 3.

† Calculated from: 100 - (Ph/8) × (8/depth).

Initially, p is 100%, therefore

$$W_o = Ac_o \int_0^h dh$$

$$W_o = Ac_o h$$

Thus, the % of original suspended solids remaining in the upper h feet of cylinder is

$$P_t = (W_t / W_o) \times 100$$

$$P_t = \frac{Ac_o \int_0^h p dh}{Ac_o h}$$

$$P_{th} = \int_0^h p dh$$

$$P_t = \frac{1}{h} \int_0^h p dh$$

The value of P_{th} can be determined readily by graphically integrating the plot of p vs. h , Fig. 2. When the curves are integrated to a limit of 8 ft., the expression becomes $Ph/8$, as shown in Fig. 2.

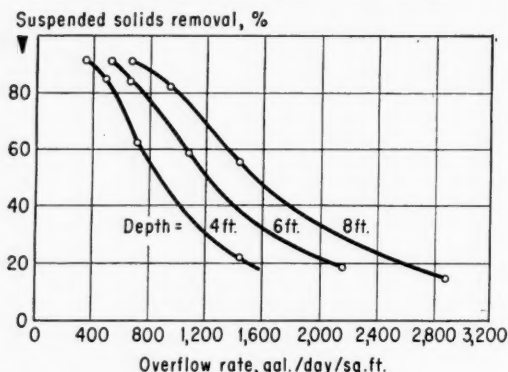
The correlations developed in the integrated family of curves in Fig. 2 have been compiled in Table II.

The surface loadings or overflow rates listed in Table II are the maximum rates at which the waste water could be applied to the clarifier to effect the indicated solids removal under ideal conditions. At these overflow rates, the theoretical upward velocity of fluid flow past the particles would be equivalent to the velocity of a particle that settles through a distance exactly equal to the effective depth of the clarifier during the theoretical detention period.

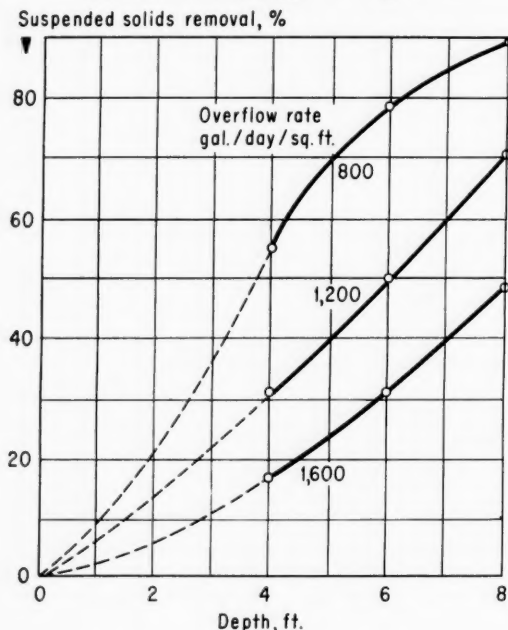
The relationships between overflow rate and suspended solids removal listed in Table II are plotted in Fig. 3 at various clarifier depths. Fig. 4 is a replot to show the relationship between solids removal and clarifier depth at various overflow rates.

The curves developed by the integration method

Relationship between suspended solids removal and overflow rate—Fig. 3



Relationship between suspended solids removal and depth—Fig. 4



duplicate those obtained by using the technique of O'Connor and Eckenfelder.² Considerably fewer calculations are required in the integration technique when several clarifier depths are investigated.

How to Apply the Correlated Data

The design engineer can use the family of curves in Fig. 3 to help him select the area and depth of a clarifier to effect a removal of suspended solids. The required surface of this ideal clarifier can be calculated for various depths by dividing the liquid flow in gal./day by the allowable overflow rate in gal./day/sq. ft. of surface area.

The relationships of Fig. 4 better illustrate the effect of clarifier depth. The volume of the clarifier is directly proportional to its depth and, since detention time depends upon volume, greater depth provides more time for particle flocculation. The increased settling rate of these larger particles then effects a higher degree of solids removal.

Any temperature difference between the laboratory and the plant operation must be compensated for in designing the full-scale facility. Because the particle settling velocity is inversely proportional to the viscosity of the suspending fluid—which varies inversely with temperature—particles will settle faster at higher temperatures. Also, particles can agglomerate faster at higher temperature.

Consideration must be given to providing additional clarifier volume for inlet and outlet losses and for sludge storage. Some turbulence, short circuiting and scour will also occur in the clarification zone. In practice, the allowable overflow rate obtained by cylinder studies is usually decreased by a factor of 1.25 to 2.00—the larger correction factors generally applying when relatively low overflow rates are being considered.⁴

References

1. Anderson, A. A., Sparkman, J. E., *Chem. Eng.*, Nov. 2, 1959, pp. 75-80.
2. O'Connor, D. J., Eckenfelder, W. W., Jr., "Biological Treatment of Sewage and Industrial Wastes," Vol. 2, p. 171, Reinhold, New York, 1958.
3. Englebrecht, R. S., McKinney, R. E., *Sewage and Industrial Wastes*, 28, 11, 1321 (1956).
4. Smith, C. E., Chain Belt Co., (private communication).



RICHARD A. CONWAY



VICTOR H. EDWARDS

Meet the Authors

RICHARD A. CONWAY is a development engineer supervising activities in industrial waste treatment for Union Carbide Chemicals Co. He has a B.S. (1953) from the University of Massachusetts and an M.S. in sanitary engineering from M.I.T. (1957). Conway is a member of ASCE, the Water Pollution Control Federation and Sigma Xi.

VICTOR H. EDWARDS is presently in his senior year at Rice University where he is studying chemical engineering. He has been employed for one summer by Humble Oil and Refining Co. and for two summers by Union Carbide Chemicals Co.

Plant Designers Need Suppliers' Help in Solving Equipment Puzzles

Fitting equipment into a plant that is still on paper is like fitting it into a giant three-dimensional jigsaw puzzle. To do so efficiently requires high-quality equipment drawings and data that author Baukol contends are largely unavailable.

PHILIP J. BAUKOL

Consulting Engineer, Vancouver, Canada.

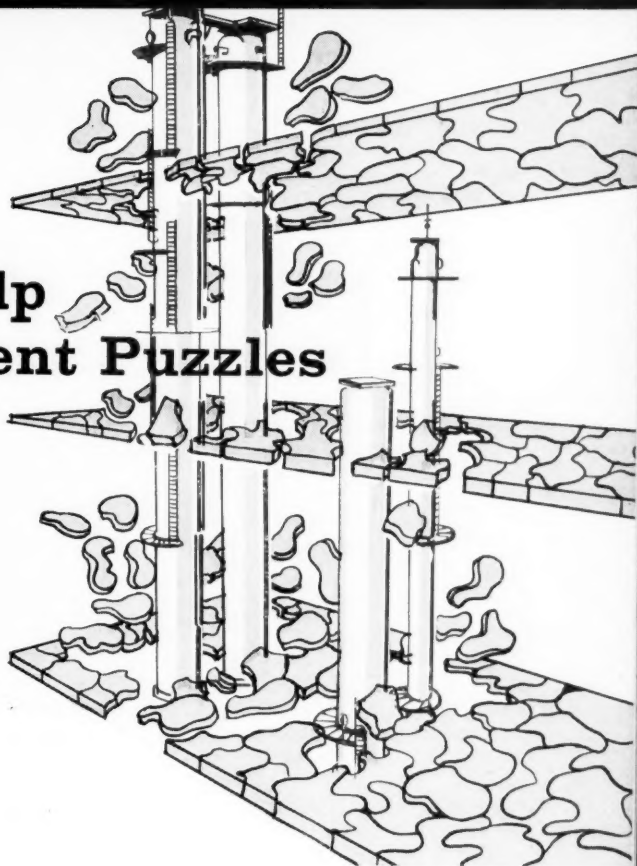
Although cost studies and accounting methods have advanced tremendously in many fields of business and industry, little has been done toward finding out how the engineering dollar is being spent. This article deals with an annoying and frequent waste of engineering time, which not only increases the cost of process plant design but also leads sometimes to expensive mistakes.

What I refer to is the substandard quality of information provided by most makers of process equipment to the plant designer in the way of necessary drawings, dimensions, weights and the like. Let me prove my case before I point to the simple cure of the problem.

An industrial processing plant will use equipment from many makers, much of it produced in sufficient quantity to justify the manufacturer's publishing expensive descriptive bulletins. The manufacturer must also spend much money in designing the equipment, in building the necessary patterns, jigs and fixtures to make it, and in testing the finished product. He must do all this before getting any return on his investment and then he must sell many units before he can get his investment back and finally make a profit.

After all this effort, and after the sale, the equipment must then be installed in a processing plant. It needs a foundation, power and other services. Materials must be brought to it and taken away, and it must be fitted into the structure and integrated with other pieces. Aisles must be kept free, headroom clearances maintained, platforms, stairways and catwalks fitted.

In these, and a myriad other ways, the equipment selected must fit into the giant three-dimensional jigsaw puzzle that is the plant. And since the plant designer has little, if any, control over the size and shape of the equipment and the locations of its connections, he needs a great deal of information from the maker.



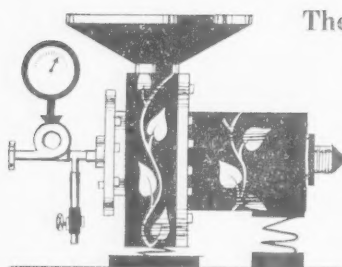
It is the designer's job to build the plant on paper before construction starts; and, he must do it with detailed dimensions of everything—and all this strictly to scale.

So, what does the equipment maker do to help him in this necessary objective? In the case of certain sorts of equipment such as pipe and fittings, structural materials and forms, and the components for drives and conveying equipment, the plant designer is usually in good shape because the dimensional and design data supplied by the manufacturers range from fair to excellent. Furthermore, such items as ducts, chutes, tanks, bins, buildings themselves, and other structures, can be tailored by the plant designer to fit the conditions.

Not so, however, with most large equipment. Although the manufacturer has gone overboard to bring

What Have We Here?

Mr. Baukol submitted the accompanying article (black type) as a letter-to-the-editor. Because of its length and its rather controversial character, *CE* decided to invite a rebuttal from the process equipment industry. To do so, we secured the cooperation of PEMA, the recently formed Process Equipment Manufacturers Assn., in the persons of J. D. Hitch, Jr., president, and R. P. Kite, executive secretary. The comments they obtained from their members appear as the blocks of type printed in color.



Needless Changes

A sensitive area in the relations between plant designers and equipment suppliers lies in the frequent requests for changes. We often see a well standardized machine revised to suit the plant designer. Frequently this is done to cater to an out-and-out whim—change for change's sake. Too often, this hap-

There's much to be said on both sides, as these comments . . .

pens repeatedly, resulting of course in poor drawings and an inevitable loss of interest on the part of everybody in the supplier's organization who is involved in supplying the customer's needs.

85 Times 40 Equals . . .

Why can't the equipment maker maintain complete and detailed drawings for use by the plant design engineer? Certainly he'd prefer to be able to do so. But, like everyone else, he has to keep a sharp eye on costs, which forces him to use the marked prints Mr. Baukol decries. In our case, for example, we make some 85 machines. These average 40 varia-

tions apiece and all are subject to continual improvement. If we were to reduce all designs to a standard, we believe our business would stagnate. In fact, it could then almost be conducted by a clerical staff.

Really Standardized

The reason why plant designers can secure the information they want on piping, conveyors and the like, is because such equipment is highly standardized, available at low cost, and is inventoried at many depots in the U.S. Such equipment is no longer amenable to individual designer license or choice.

the equipment into being, he now seems unwilling to make sure it is properly installed because he fails to provide the information that will make this possible.

The following is almost standard operating procedure: a line drawing in the manufacturer's bulletin shows two elevations but no plan view. It has dimension lines, but no dimensions. The latter have to be picked off from a table of various sizes and models. The drawing generally bears the warning "DO NOT USE FOR CONSTRUCTION." Then, if the plant designer phones the manufacturer's nearest branch office for help, he receives a substantially identical print that is larger but, in addition to the "DO NOT USE FOR CONSTRUCTION" note, carries the further warning: "SCALE: NONE."

Eventually, when the designer receives the final item, a print marked "APPROVED FOR CONSTRUCTION" he finds it to be still the same two views—with-out a plan view, with tabulated dimensions and, still, with nothing drawn to scale.

With information of this sort, of course, the designer is stymied in his need to make a scale drawing in three views, with details and sections. The best he can hope for is to make a "reasonable facsimile," which may be sufficient for a box-top contest but is hardly adequate for modern engineering. Not only that but, at the minimum, this extra drafting will cost him at least \$50. If the manufacturer sells 100 of that model before it is superseded, then at least \$5,000 must have been spent by his customers—needlessly, I contend.

Suppose the manufacturer decides to provide acceptable drawings. What will it cost him? Since his files already contain assembly and detail drawings, he needs only a straight drafting job, costing perhaps \$75, plus offset plates, paper and printing for another \$25. For \$100, he can now provide his 100 customers

with adequate drawings at \$1 per customer. It is hard to estimate how many trips his sales engineers will save, not having to clear up troubles due to faulty installation, but less than one such trip saved would repay the \$100 investment.

It is not only drawings and dimensional data that the plant designer lacks, however. Often the design criteria provided by the equipment maker are no better than the drawings. For example, I have seen engineers spend many hours searching every possible avenue, simply to find the weight of the unit.

In one case, the manufacturer supplied an outline foundation drawing that showed the weights of the concentrated and continuous loads—more information than we usually get. However, the drawing failed to mention that a gear reducer, noted as weighing 190 lb., would when running produce a chain pull that would cause an uplift of several thousand pounds on the hold-down bolts.

One manufacturing company developed and printed excellent design data for mounting its vibrating equipment. However, this information was sent out only on specific request. In another instance, a manufacturer failed to point out that a certain shaft had to be removed periodically to replace a wearing part. The unit was installed with the shaft in line with a building column so that a routine maintenance job turned into a major relocation operation for the millwrights and riggers, and resulted in an extended plant shutdown.

It is common practice for basic information to be missing; for example, power, speed, starting torque and details regarding other services needed. Certainly, the toll in engineering time and unnecessary construction and reconstruction that results from lack of information and actual misinformation must be enormous.

At a guess, a few hundred dollars should in most

cases pay for the adequate design criteria needed by the manufacturer's customers. This estimate is intentionally large to allow for the outside help evidently needed by many equipment makers to acquaint them with plant design needs. None of the examples cited come from "hole-in-the-wall" equipment concerns; all are from among the leaders in the industry.

Nevertheless, not one of these concerns will furnish a scale drawing we can use for tracing our layouts and working drawings. The only one that can supply proper design criteria for installation, values them so slightly that one must prod the sales department to secure them. When we do get drawings, they appear to show little conception of what the plant designer must have to do his job.

What actually does the plant designer need? Not too much, I am sure. Let's tabulate his needs:

- An outline drawing, fully dimensioned on an 8½ x 11-in. sheet of high-transparency paper, which can be traced either face up or face down, and used on top of layouts for trial locations. This normally would have a plan and two elevations, printed at a scale of ¼ in. = 1 ft., plus larger-scale details and sections at critical points such as inlets, discharges and other connections. (The original would probably be drawn twice this size, 17 x 22 in., and reduced for printing.)

- On the same drawing, or on separate 8½ x 11-in. sheets, small schematic views, showing typical arrangements, with usual appurtenances such as foundations, drive, feed, discharge and service connections. Also, design criteria required by mechanical, structural and electrical engineers for intelligent plant design as it relates to the unit.

Manufacturers on whom I have urged these simple improvements generally raise the following objections:

We make too many sizes to have a drawing of each size. My reply: any size worth space in an expensive bulletin is worth a simple scale-outline drawing; and the cost of offset printing is almost negligible.

Each model is assembled in a dozen different ways. To which I say: one drawing will usually suffice. Take a centrifugal fan, for example. It can be assembled clockwise or counterclockwise in 8 standard locations of the discharge—or 16 standard assemblies. By tracing face up and face down, and pivoting the discharge about the center line, all 16 assemblies can be traced.

Although we have a standard unit, we seldom make it standard; it's always special. Well, my point here is that the manufacturer's standard model should be used for the scale-outline drawing. Modifications are usually made according to customers' ideas or to meet local conditions, so plant designers will have details.

... from a number of prominent equipment makers will show.



regard and to improve all aspects of a project. It is always borne in mind that the basic objectives of both buyer and seller are much the same and that the better the information supplied, the sooner the job can be completed and the profit generated.

Not So Standard!

Over the years, we have sold about 225 different machines, each in many sizes and materials of construction. Unfortunately, these are called "standard." We have some 100 sales engineers who call on potential customers—and, as a matter of statistical interest, it takes about 14 months, on the average, from initial contact to date of sale. During the course of such contacts, we often provide a vast number of drawings of our "standard" machines, along with repeated proposals involving a substantial amount of estimating engineering. However, only a small percentage of this effort results in real business. All equipment man-

ufacturers incur very substantial expense for such engineering, which is probably given too freely. This custom stems from earlier times when profit ratios could support it but today the system is questionable.

The Olde Order Changeth

Most customer engineers are not fully aware of the extent to which our research and development program continuously affects the details of the equipment we supply. Add this constant state of flux to the time factor—from initial sales contact to final delivery—and you can see why we feel we must withhold certified prints until we arrive at complete agreement with the customer. Time? From inquiry to order, it ranges from three months to three years, plus manufacturing time from five months to one and one-half years. We pride ourselves on being unwilling to supply a unit that does not incorporate the latest improvements.

Both Sides—Same Objectives

The buyer's engineer is naturally and intensely interested in one or at most a small number of projects. Therefore, he tends to forget that the equipment supplier is simultaneously involved in many projects. The supplier understands this viewpoint and certainly has no quibble with the user's objective of complete information. However, how thoroughly he can satisfy it varies from company to company and depends on many factors, such as quality of sales engineers and methods of operation. Most organizations try to be as flexible as possible in this

PEMA members also made these points in answer to Mr. Baukol.

Not Much of a Problem

Some PEMA members not only manufacture and sell equipment but also do a great deal of plant design in their own specialized fields. Such designs inevitably include the equipment of other suppliers, so these designers are exposed to the same problems described by Mr. Baukol—to the ex-

tent that they exist. In general, our members find they experience some of these difficulties occasionally, but not to a serious degree.

"We Need It Yesterday"

The time element is an important factor in getting complete information to the user. All too often, the customer's purchasing depart-

ment sets up unreasonable dates; often, it appears, without reference to their own engineering department. Since we have to process an average of 100 estimating requests every week, each involving drawings, we naturally have to satisfy many of these requests with litho drawings or typical machine drawings, "not to scale."

Our equipment is too large for an 8½ x 11-in. sheet. Perhaps, but there are ways around this. For example, a rotary kiln hundreds of feet long can be shown on five 8½ x 11-in. sheets by drawing broken sections and illustrating the feed end, firing end, drive-pier assembly, trunnion-pier assembly, and finally adding a small-scale over-all drawing that gives principal horizontal, vertical and sloped dimensions. Sometimes a unit can be shown to smaller scale than ¼ in. = 1 ft.; for example, ½ in. = 1 in. = 20 ft.

Our equipment is too small; ¼-in. scale doesn't give the required detail. That's easy—draw it to larger scale and then repeat the drawing for a ¼-in. scale reproduction in the upper righthand quarter of the sheet.

We revise equipment so often that drawings become obsolete almost as soon as printed. My reply here is that such revisions seldom affect the plant designer. I can't recall a single instance where we had trouble as a result of using cuts or prints marked "DO NOT USE FOR CONSTRUCTION."

Your suggestion would have only limited use since not all drawings and layouts are made at a scale of ¼-in. = 1 ft. Well, that's true, but it's not a fatal defect. The ¼-in. scale is most common for layouts and general arrangements—which is why I suggested it for the standard. However, the scale used in drawing a large unit to fit an 8½ x 11-in. sheet is quite probably the scale that would be used for the plant layout and general arrangement—which is why I have suggested the 8½ x 11-in. sheet.

The drawings you ask for would give too much information to our competitors. Don't you believe it! The proposed outline drawings are exterior views, of little if any real value to competitors. Probably the bulletin has already told in considerable detail, and in cross sections and "exploded" views, just what materials are used and how the machine works.

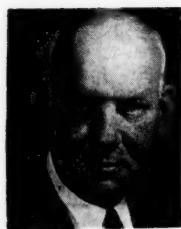
It is my hope that this discussion will convince equipment manufacturers that better drawings and design criteria are essential to intelligent plant design. But should the cost angle still be a stumbling block, it seems only necessary for these manufacturers to consider how many trips by sales and field engineers could be obviated.

Meet PEMA

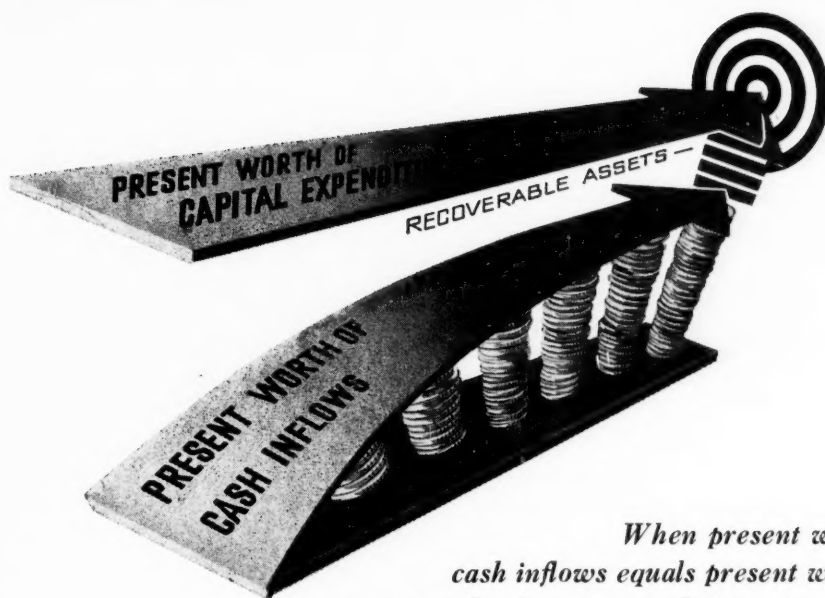
Organized in January 1961, Process Equipment Manufacturers Assn. (PEMA) consists of some 29 leading concerns in the process equipment field. J. D. Hitch, Jr., formerly president of Dorr-Oliver Inc., is president of the new organization. R. Paul Kite, for many years a Dorr-Oliver engineer until his recent retirement, is executive secretary and treasurer. To quote from PEMA's expressed purposes: "PEMA . . . resulted from discussions between a few companies . . . wherein unnecessary and costly practices in the Process Equipment industry were reviewed, together with their effect on our customers. A determination was arrived at to pinpoint these wasteful costs and, by spreading the knowledge of their existence throughout the industry, to allow companies to study their own costs, thus permitting them to make their own independent decisions as to the reduction or elimination of waste . . ."

Some of PEMA's interests include presale engineering and estimating costs; protection of "know-how;" personnel practices; economic studies; trade shows and conventions; standards; encouragement of engineering education.

Meet the Author



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When present worth of future cash inflows equals present worth of capital investment, the compound interest rate represents the profitability of a proposed venture.

Graphs Can Reveal Project Feasibility

HERBERT E. SCHWEYER
University of Florida

Profitability models that evaluate the economic feasibility of a new project are receiving more and more attention because of the greater emphasis on including the time value of money and the influence of the profits tax in the calculations. Basic principles for these theoretical models and other less sophisticated ones have been presented by Schweyer¹ but interpretative diagrams were not shown. The purpose of this article is to present the basic diagrams in several forms to provide a visual aid in understanding the model.

The underlying principle of all profitability models utilizing the time value of money may be stated quite simply. When the present worth of all future cash inflows from the operation, at some interest rate i_z , is exactly equal to the zero-time present worth of the capital expended, then the i_z is a measure of the earning rate or profitability of the venture. Expressed in a word equation,² this statement becomes:

$$\left(\begin{array}{c} \text{Zero-Time Present Worth} \\ \text{of Capital Expenditures} \end{array} \right) = \left(\begin{array}{c} \text{Zero-Time Present Worth} \\ \text{of Cash Inflows} \end{array} \right)$$

Cash inflows in any project result from (1) excess of revenues over costs, (2) tax credits for depreciation

and (3) recoverable assets at terminal age in the form of land, working capital and salvage.

In algebraic form, this relation becomes:

$$P_z = (1 - t) \sum_{n=1}^{n=N} (S - C)/(1 + i_z)^n + t \sum_{n=1}^{n=N} D/(1 + i_z)^n + L/(1 + i_z)^N \quad (1)$$

P_z = Zero-time present worth of all cash inflows (sometimes called the discounted cash flow).

t = Profits tax rate expressed as a fraction.

S = All annual revenues attributable to project.

C = All annual costs and expense except depreciation attributable to project.

D = Annual depreciation.

L = Recoverable assets in form of working capital and salvage at terminal life N .

n = Age at which interest is compounded for each year.

N = Total number of compounding periods.

Eq. (1) will be recognized as a mathematical model that may be analyzed by discrete steps, where n equals integers of 1, 2, 3 . . . N . Therefore, Eq. (1) may be programmed on any suitable computer. It will apply for any combination (uniform or nonuniform) and series of annual expenses, costs, depreciation procedure and interest rate.

Zero-Time Present Worth Diagram

To determine the unknown interest rate i_z that makes P_z exactly equal to the zero-time present worth

How to analyze zero-time present worth calculations—Table I

End of Year n	Revenues (1 - t) × (S - C)	Depreciation D	Tax Credits tD	Cash Inflow ¹	Interest Factor ² (1 + i) ⁿ	Present Worth ³	Cumulative Present Worth
0	0	0	0				
1	0.192	0.343	0.178	0.370	1.180	0.314	0.314
2	0.192	0.286	0.148	0.340	1.392	0.244	0.558
3	0.192	0.229	0.119	0.311	1.643	0.189	0.747
4	0.192	0.171	0.089	0.281	1.939	0.145	0.892
5	0.192	0.114	0.059	0.251	2.288	0.110	1.002
6	0.192	0.057	0.030	0.222	2.700	0.082	1.084
Total present worth of accumulated revenues							1.084
Present worth of recoverable assets = 0.200/2.70							0.074
Total zero-time present worth, ³ P _x							1.158

1. Cash inflow is sum of revenues and tax credits. All dollar figures in millions.

2. Interest factor computed at 18% for first trial.

3. Since P_x is smaller than P_t, the assumed earning rate is too high and another trial is required. P_t = 1.4(1 + 0.18)¹ = \$1.652 million.

of the capital expenditures requires trial and error. This trial-and-error solution is shown on the zero-time present worth diagram of Fig. 1 for the following example.

An initial expenditure of \$1.4 million is made for expansion of facilities that begin to produce one year after commitment of funds. The venture has an expected life of 6 yr., with salvage of \$100,000 and working capital of \$100,000 being recovered at the terminal date. What is the profitability of this venture in terms of earning rate if the profits tax is 52% and the annual net revenues minus costs (excluding depreciation) are \$400,000? Use sum-of-digits depreciation.

The solution to this problem is shown on the present worth diagram of Fig. 1 from the computations in Table I. The procedure is:

1. Assume an interest rate i_x .
2. Compute the zero-time present worth of the initial commitment (and any other supplemental investments, which are reduced to zero time) and plot their value as shown in Fig. 1 for P_t .
3. Compute the present worth of all regular and irregular annual revenues S . Note that if these are regular, their sums can be determined as the sum of a series without the necessity of a stepwise summation as shown in Table I.
4. Compute the present worth of all costs in the same manner as for revenues in Item 3.
5. Compute the present worth of the tax credit for depreciation as in Item 3. (Special summations for present worth of different forms such as declining balance and sum-of-digits depreciation are available.)

6. Determine the present worth of the recoverable assets (land, salvage, working capital) at end of terminal year.

The computed data are assembled according to Eq. (1) in any convenient form, and P_x is compared with P_t . When the proper i_x is found that makes them equal, the profitability is evaluated. Thus, as shown in Fig. 1, the value of P_t at 6 yr. becomes a target point that must exactly coincide with the cumulative zero-time present worth of net revenues and tax credits plus salvage.

The results in Table I show that for the 18% trial, the zero-time present worth accumulations of \$1.158 million are less than the zero-time present worth of the investment of \$1.652 million. Accordingly, a lower interest rate must be assumed. Trying 8.2% gives the results shown in Fig. 1. Hence, Eq. (1) is satisfied so that P_x is equal to P_t of $(1.4 \times 1.082) = \$1.515$ million at zero time.

Where the present worth of a series of payments can be computed directly, the computations can be simplified and tabulations are not required. For example, the cumulative present worth of the uniform annual revenues in Table I is:

$$\begin{aligned} \text{Present worth of revenues} &= 0.192 P_F \\ &= 0.192 (3.498) = \$0.670 \text{ million} \end{aligned} \quad (2)$$

where P_F is the present worth factor for 18% and a 6-yr. life.

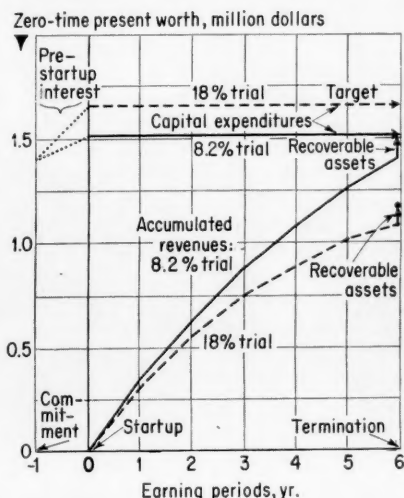
Present worth of a sum-of-digits depreciation is:

$$2(P - L)(N - P_F)/N i_x(N + 1) \quad (3)$$

where $(P - L)$ is sum of capital to be depreciated, N is compounding period and P_F is present worth factor.

Using the data given in the preceding example

Zero-time present worth diagram compares rates of return—Fig. 1



and applying Eq. (3) gives the present worth of the depreciation, allowing for tax credit, as \$0.414 million. The sum of \$0.670 and \$0.414 must and does equal the total of \$1.084 million shown in Table I, computed in stepwise manner.

Further consideration of the basic economic theory shows that for uniform annual returns R (where R is the sum of all profits and depreciation charges) and with terminal assets L , the profitability may be obtained from:

$$P_I = RP_F + L/C_F \quad (4)$$

P_I = Zero-time present worth of capital expenditures.
 R = Uniform annual return.
 P_F = Present worth factor $(C_F - 1)/(i_x C_F)$.
 C_F = Compound interest factor $(1 + i_x)^N$.
 L = Recoverable assets at terminal age.
 N = Terminal age.

This relation is rigorous for uniform R but may be used as an approximation for nonuniform R when average values are used. Thus, in the example, the value of R would be the sum of \$192,000 plus the average for sum-of-digits depreciation, which is \$1.2 million divided by 6 yr., or \$200,000. This is the same as straight-line depreciation. The tax credit per year would be \$200,000 $(0.52) = \$104,000$.

To solve Eq. (4), it is necessary to determine an observed present worth factor P_F from:

$$P_F = [P_I - (L/C_F)]/R \quad (5)$$

For an assumed interest rate i_x , P_I at zero time and C_F are computed and Eq. (5) is used to find an observed P_F . This is then compared with tables^{1,2} of P_F for the assumed i_x and known N . Interpolations in the tables^{1,2} are made for the sought value of i_x . Thus, for the example, assume i_x is 7.9%, and that R equals \$192,000 plus \$104,000, or \$296,000. Substituting in Eq. (5) gives the present worth factor as:

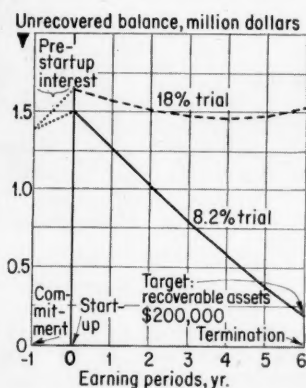
$$P_F = [(1.4)(1.079) - (0.2/1.079)]/0.296$$

$$P_F = [1.509 - 0.127]/0.296 = 4.67$$

This observed P_F value agrees approximately with calculated values of P_F or from tables for $i_x = 7.9\%$ and $n = 6$ yr. Hence, the desired interest rate is approximately 7.9%, using average depreciation. This value is in substantial agreement with the 8.2% found for the more rigorous method developed from the calculations for Fig. 1.

The zero-time present worth procedure will be recognized as the basis for the method developed by Weaver and Reilly.³ The method shown here is straightforward without recourse to factor corrections. Furthermore, it is amenable to other procedures that

Use unrecovered balance to find profitability—Fig. 2



Unrecovered balance method—Table II

Year	Year-End Total*	Accumulations (At End of Year)	Unrecovered Balance
-1	1.400	1.400
0	1.652	1.652
1	1.950	0.370	1.580
2	1.864	0.340	1.524
3	1.798	0.311	1.487
4	1.754	0.281	1.473
5	1.738	0.251	1.487
6	1.754	0.222	1.532†

* All dollar figures in millions. Interest is 18% for first trial.

† Since this balance is considerably in excess of the available amount of recoverable assets of \$200,000, the interest rate is too high and another trial is required.

may be desired with either discrete or continuous machine programming.

Unrecovered-Balance Diagram

A modification of the zero-time present worth model is the unrecovered-balance diagram of which a recent example was demonstrated by Hackney.⁴ This procedure is a simple variation of Fig. 1 in which the current unrecovered balance at any year, allowing for interest at the i_r rate, is plotted. When the unrecovered balance is exactly equal to the recoverable assets at the N th year, the assumed interest rate is the correct earning rate and represents the profitability. The data for the previous example are employed in Table II and plotted in Fig. 2.

As shown for a trial of 18%, the target point of \$200,000 salvage at the sixth year is not met. Hence the assumed interest rate is incorrect. By assuming 8.2% return as shown in Fig. 2, the target value is reached and this interest rate is the economic rate of return or profitability. It is exactly the same as found for the zero-time present worth method.

The basic principle underlying the unrecovered-balance method is the same as given by Eq. (1). The difference is that all terms are multiplied by $(1 + i_r)$ until the N th year, at which time the unrecovered balance must exactly equal L . This method may be preferred by some engineers because it gives the accumulated equivalent deficit from year to year in terms of dollars, allowing for interest. It gives the same result as the zero-time present worth method. The advantage of the latter is its more simple justification by economic theory equations.

The more direct procedure for a uniform annual return R would be given (as derived from Eq. 4) by multiplying by $C_F = (1 + i)^n$ to give the following equality at the N th year:

$$P_i C_F = R \left(\frac{C_F - 1}{i} \right) + L \quad (6)$$

Eq. (6) will reduce to Eq. (5) for quick solution when average values of R are employed.

Continuous Function Models

For certain types of machine programming, the use of continuous functions would be desirable. The term $C_F = [1 + (i/m)]^{mn}$ for discrete compounding approaches $C_F = e^{in}$ as m becomes infinitely great. Here, n is in years, i is the nominal annual interest rate and m is the number of times compounded per year.

Under the condition of continuous compounding, e^{in} may be substituted for $C_F = (1 + i)^n$ in the previous equations. It should be obvious that for a series of periodic annual dollars, R , to be equivalent to an initial amount, P_i , the interest rates will differ depending upon whether discrete or continuous compounding is employed.

Thus, a lower nominal annual rate i will be required in continuous compounding to give the same future equivalent values as by discrete compounding. Theoretically, this difference is of no importance since all

comparisons of profitability made on one or the other basis should be compared with others made on a like basis.

The advantage of continuous compounding is demonstrated by rewriting Eq. (1):

$$P_z = (1 - t) \int_0^N (S - C) e^{-in} dn + t \int_0^N D e^{-in} dn + L e^{-iN} \quad (7)$$

Eq. (7) may now be mathematically manipulated² in a variety of ways, so as to determine maximum present worth and other interesting evaluations when the functions S , C and D are known in terms of n , and L is a function of N .

To demonstrate the use of Eq. (7), consider the previous example with net revenues $(S - C)$ equal to an annual rate of \$400,000, straight-line depreciation at an annual rate of \$200,000, a 52% profits tax, and a terminal salvage value of \$200,000.

Determine the profitability for the \$1.4-million investment one year prior to startup, with a 6-yr. project life and the use of continuous compounding.

Applying the data to the model of Eq. (7) requires a trial-and-error solution as follows:

$$\begin{aligned} (1.4) e^i &= \int_0^N [(1 - 0.52)(0.4) + 0.52(0.2)] e^{-in} dn + 0.2 e^{-6i} \\ 1.4 e^i &= 0.296 \int_0^N e^{-in} dn + 0.2 e^{-6i} \\ 1.4 e^i &= -0.296 e^{-in}/i \Big|_0^N + 0.2 e^{-6i} \\ 1.4 e^i &= (0.296/i) (1 - e^{-6i}) + 0.2 e^{-6i} \end{aligned}$$

By trial and error, i is found to equal 8.3%, which is the economic rate of return or profitability for the project under the conditions stipulated with continuous compounding.

References

1. Schweyer, H. E., "Process Engineering Economics," McGraw-Hill, New York, 1955.
2. Schweyer, H. E., textbook manuscript in preparation.
3. Weaver, J. B., and R. J. Reilly, *Chem. Eng. Prog.*, 52, 405 (1956). Correction, Oct. 1956, p. 448.
4. Hackney, J. W., *Chem. Eng.*, May 15, 1961, pp. 157-160.

Meet
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Author



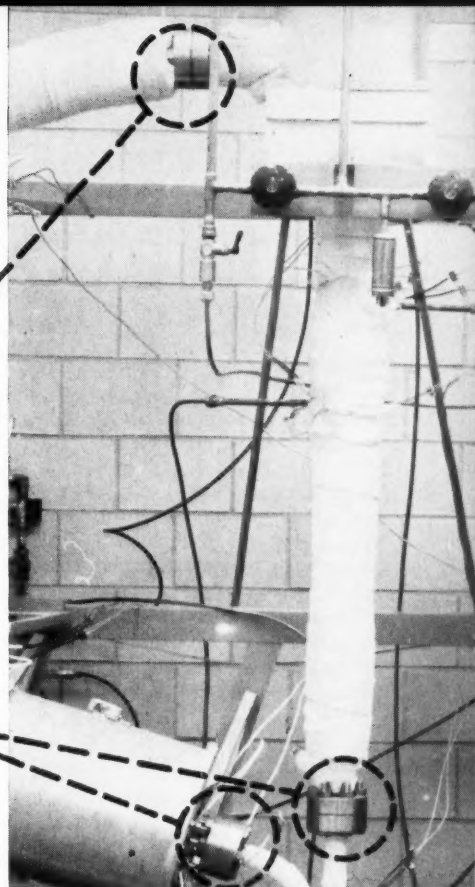
HERBERT E. SCHWEYER is professor of chemical engineering at the University of Florida in Gainesville. He has a B.S. in Ch. E. and an M.S. from Lafayette College and a Ph.D. in chemical engineering from Columbia University. He is a member of ACS, AIChE, AACE and the Assn. of Asphalt Paving Technologists, and is a registered professional engineer in Florida.



▲ Stainless steel modified tongue-and-groove flange assembly with iron gasket shown prior to installation in a test loop.



▲ Stainless steel ring-joint flange with iron ring after service of 4,400 hours in a thermal test loop. Note corrosion-free parts.



Use of Flanged Joints In Liquid-Metal Service

J. C. CLIFFORD and GEORGE BURNET, *Iowa State University of Science and Technology, Ames*

Liquid metals—as nuclear reactor coolants, reactor fuel carriers, and media for high-temperature reprocessing of irradiated fuels—are now the subject of considerable research interest. And in the study of liquid metals, it is frequently necessary to erect small-scale circulation systems for them. Because of their experimental nature, it is an advantage to be able to add, remove and replace test sections or pieces of equipment to these systems without having to dismantle them.

Though flanged connections afford such flexibility, published information shows that their use has been limited and not particularly successful. Wherever possible, it is often said, welded joints should be used rather than flanged. One reason for this preference is that many flanged bolting materials relax at high temperature, resulting in leakage at the flange. Also, common gasket materials are incompatible with liquid metals because of severe uniform solution attack or selective removal of one or more constituents. Still, we believe that advantages offered by flanged joints remain a strong incentive for their use in a small-scale system.

Materials of Construction

In tests described here, we examined bolting ma-

terials from the standpoint of temperature coefficient of expansion, as well as from that of high-temperature creep. All tested designs gave satisfactory results as long as three criteria were observed, namely that:

- The bolting material have a coefficient of expansion less than that of the flange and gasket material, to maintain the seal when temperature was increased.

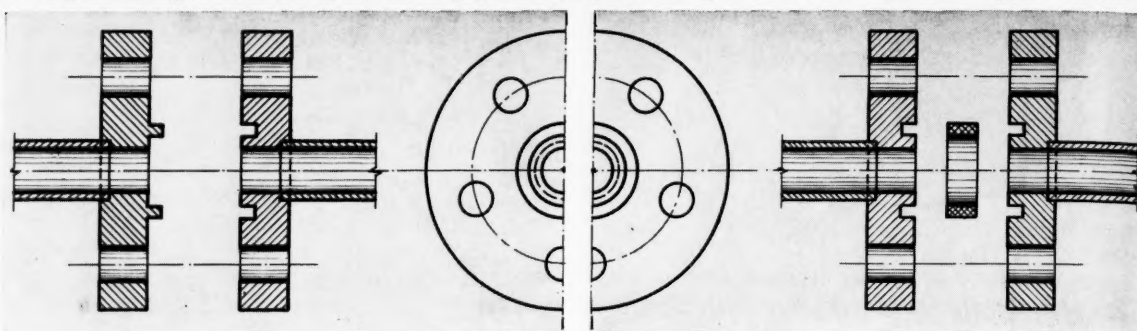
- The flanges be sufficiently thick to prevent warpage and to provide tension on the bolts, due to expansion with temperature.

- The bolting and gasket materials not be subject to relaxation at high temperatures.

Suitable flange materials to contain the lead-bismuth eutectic melt had been previously determined, but acceptable gasket materials were harder to find. Because of their solubility in the liquid metal, such metals as copper, platinum, nickel, aluminum and silver were excluded. Corrosion-resistant metals such as tantalum and molybdenum are subject to severe atmospheric oxidation unless shielded. Iron (though requiring shielding for extended service) and stainless steel were satisfactory, and in some cases, non-gasketed joints gave excellent performance.

Before use in flowing systems, the various joints were evaluated by static testing. Short, flanged pipe sections, sealed at one end, were filled with liquid

Tongue-and-groove (left) and ring-joint (right) flanges were two of four types tested.



metal, held at high temperatures and pressures of 20-50 psig. for up to 7,500 hours. During individual tests, we cycled temperature occasionally from about 500 F. to 1,100 F.

The most promising designs were then used extensively in both thermal and forced convection loops. One thermal convection loop is shown, on page 179, in a partially insulated stage of construction. In its closed system, one vertical section was maintained at higher temperature than the other; the resulting liquid-metal density difference produced flow.

We evaluated four flange designs in this study.

Ring-joint flanges. Of 18-8 stainless steels, these 3-in. O.D., 0.5-in.-thick flanges were held by five or six $\frac{3}{4}$ -in. 321 stainless bolts. They were drilled for welding to 0.5-in. IPS pipe. The $\frac{3}{4}$ -in.-thick iron rings were 1-in. O.D. and $\frac{3}{4}$ -in. long. Unpolished, all bearing surfaces were carefully machined.

A drawing of the flange is shown, above right, and a photograph on the previous page shows such a flange after 4,400 hours of satisfactory service in a thermal loop. Note that the bearing surfaces are still bright and free of corrosion.

Tongue-and-groove flanges. Shown at left above, this flange was of same over-all dimensions and material of construction as the ring-joint flange. Its raised tongue was 1.75-in. O.D., $\frac{1}{2}$ -in. thick and $\frac{1}{2}$ -in. high. The groove in which it fit was $\frac{1}{2}$ -in. deep and $\frac{1}{2}$ -in. wide. Bearing surfaces were carefully machined; gaskets, when used in the assembly, were made of 20-mil-thick tantalum sheet.

Raised-face flanges. Of the same over-all dimensions and material, flanges were prepared with raised bearing surfaces $\frac{1}{2}$ -in. wide on both flanges. We machined these surfaces with concentric grooves, like those on a phonograph record except for being coarser. Gaskets were 20-mil-thick tantalum sheet.

Modified tongue-and-groove flanges. Machined from 3.5-in.-dia. 446 stainless bar stock, these flanges were sealed with polished 20-mil-thick iron gaskets. Bolt material was austenitic stainless steel nominally composed of 14-16% chromium, 33-36% nickel and 0.15% carbon.

A photograph of this flange (with its gasket) is shown on the previous page. Faces of such flanges have either one or two tapered raised rings, $\frac{1}{2}$ -in. thick at the base and $\frac{3}{4}$ -in. thick at the bearing surface, which fit together deforming the gasket. The seal

formed passes helium mass-spectrometer leak detector tests at ambient temperature.

Ring-joint flanges. Static tests of up to 1,500 hr., during which pressure on the liquid metal varied from 8 to 50 psig. and temperature was 570-1,100 F., failed to cause leakage.

In an 18-8 stainless thermal convection loop, two flanges performed satisfactorily for the 4,400-hr. life of the loop. Temperature was increased gradually from 480 to 1,100 F., and cycling over this entire operating range failed to produce leakage. After loop shutdown, these joints showed no evidence of seepage, but when Inconel bolts were used, leakage did occur because of bolt relaxation.

Tongue-and-groove flanges. This flange required careful alignment and uniform bolt tension for a good seal. One assembly without a gasket held at 1,000 F. for 7,700 hours before leakage.

Raised-face flanges. Failure occurred after a few hundred hours when gasket material subject to atmospheric oxidation was used. High temperatures increased the likelihood of early failure.

Modified tongue-and-groove flanges. Of nine tested in thermal and forced convection loops, several were installed where temperature cycled between ambient and 1,100 F.; two were opened and resealed three times. Only once did the flange develop a leak—upon oxidation of the iron gasket during extended operation at 1,100-1,300 F. Use of an iron-chromium alloy has been suggested to reduce chances of this failure.

Ring-joint and modified tongue-and-groove flanges were most satisfactory, but the latter are preferred. They provide a vacuum seal necessary to evacuate the system prior to charging liquid metal. They also function well despite some initial misalignment of the sections to be joined. Ring-joint flanges, however, require careful alignment to avoid leakage.

Though a ring-joint flange provides a seal against liquid metal at 50 psig., it won't permit adequate evacuation of a loop. We had to use an additional seal—a soft O-ring—in the ring-joint flange to draw a vacuum on a loop. Too, equal tensile strength must be applied to all bolts in the assembly to ensure a seal; closure of the modified tongue-and-groove does not require this.

Finally, the modified tongue-and-groove flange can be opened and resealed quickly and easily by replacing the gasket. The bearing surfaces of the ring-joint flange, however, usually require cleaning.

Estimate Viscosities by Comparison With Known Materials



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E. I. du Pont de Nemours & Co.

Viscosity of a liquid, slurry, polymer melt or like material has an important bearing on the design and power requirements of suitable equipment for processing the material. Because many materials do not exhibit a constant viscosity for all flow conditions, a shear-stress vs. shear-rate diagram for the operating conditions is needed to determine the viscosity characteristics.*

For many preliminary investigations, no such shear diagram or other viscosity measurement is available. Therefore, an estimate of viscosity can be made by comparing flow characteristics of the material with those of known materials.

As a basis for rough comparisons, a viscosity-spectrum chart as shown on the next page is valuable. The chart covers a range of viscosity of over 30 orders-of-magnitude. An attempt has been made to include many common materials that are often used as a basis of comparison with a material to be processed. Consequently, both Newtonian and non-Newtonian materials are included.

Since the viscosity of non-Newtonian materials depends on the shear rate and, hence, on the shear stress at which shear occurs, a single value of viscosity can be only a representative value. In some cases, the shear rate is given. In other cases, the viscosity given shows approximate magnitude for conditions under which material is often used or observed. (Values

for materials with viscosities over about 10^7 poises were determined from creep measurements. In such measurements, the rate of deformation under a constant stress is observed for long periods of time.)

In chemical processing applications, the range of viscosities is over 10 orders-of-magnitude. This is far broader than the range of specific heat or thermal conductivity usually encountered. In preliminary investigations, where no data are available on specific heat or thermal conductivity, engineering correlations together with experience are usually satisfactory to estimate these physical properties within a factor of two to five.

Estimates of viscosity in the absence of specific measurements are apt to have a much greater inaccuracy. For this reason, the viscosity spectrum should be helpful in estimating the viscosity of a specific material for which viscosity data are not available, by comparing its viscosity with that of known materials.

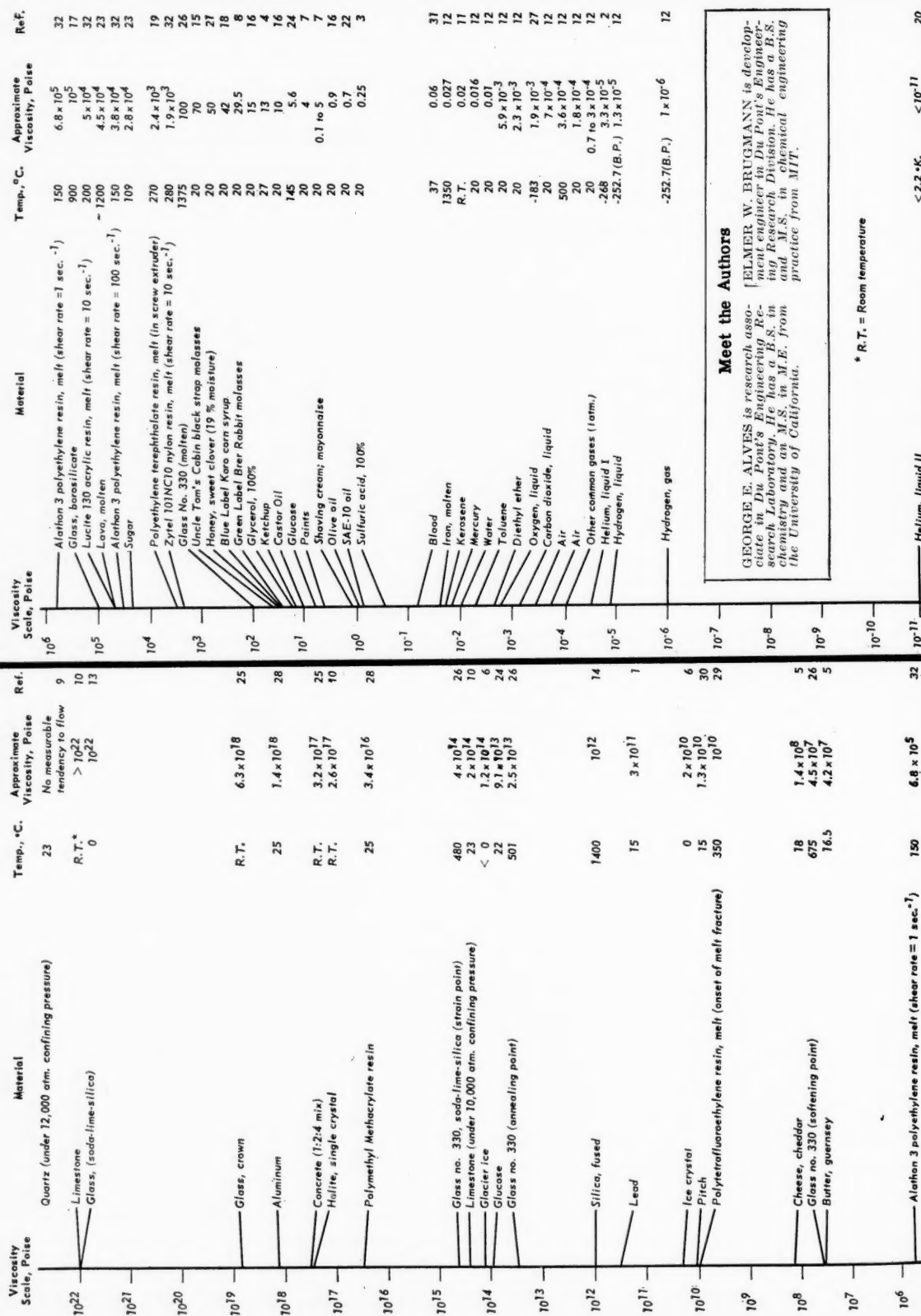
Of course, in making such comparisons, we must be on guard for erroneous impressions. For example, in comparing the viscosity characteristics of ketchup and honey, we may have the impression that ketchup is the more viscous, yet the chart shows that honey is. The reason for this anomaly is that ketchup exhibits a yield stress. In other words, some initial stress such as produced by hitting the bottom of the bottle is required before the ketchup will begin to flow. After sufficient initial stress has been imposed, the ketchup will flow freely owing to thixotropy. Honey, on the other hand, exhibits no yield stress and only a slight thixotropy. Hence, it is nearly Newtonian in behavior.

Turn to p. 182 for chart. * * *

References

1. Andrade, E. N. DaC., *Proc. Roy. Soc. (London)* **A84**, 1 (1911).
2. Bowers, R. and K. Mendelssohn, *Proc. Roy. Soc. (London)* **A204**, 366 (1950).
3. Bump, T. R. and W. L. Sibbitt, *Ind. Eng. Chem.*, **47**, 1665 (1955).
4. Cohee, Jr., R. F. and R. Goudale, *Fruit Products J.*, **19**, 202 (March, 1940).
5. Davis, J. G., *J. Dairy Research*, **8**, 245 (1937).
6. Deeley, R. M., *Proc. Roy. Soc. (London)* **A81**, 250 (1908).
7. Fischer, E. K., "Colloidal Dispersions," Wiley, New York, 1950.
8. Foster, S. H. (Penick & Ford Ltd., Inc., Cedar Rapids, Ia.), personal communication, Feb. 20, 1961.
9. Griggs, D. T., *J. Geol.*, **44**, 541 (1936).
10. Griggs, D. T., *J. Geol.*, **47**, 225 (1939).
11. "International Critical Tables," Vol. 2, McGraw-Hill, New York, 1927.
12. "International Critical Tables," Vol. 5, McGraw-Hill, New York, 1929.
13. Jones, G. O., "Glass," Methuen, London, 1956.
14. Kingery, W. D., "Introduction to Ceramics," Wiley, New York, 1960.
15. Kohler, F. C. (J. Stromeyer Co., Phila., Pa.), personal communication, Feb. 14, 1961.
16. Lange, N. A., "Handbook of Chemistry," 9th ed., McGraw-Hill, New York, 1956.
17. Lillie, H., *J. Am. Ceram. Soc.*, **14**, 502 (1931).
18. Lucas, D. E. (Corn Products Co., Argo, Ill.), personal communication, Feb. 8, 1961.
19. McKelvey, J. M., *Ind. Eng. Chem.*, **45**, 982 (1953).
20. Mendelssohn, K., *Science*, **127**, 215 (1958).
21. Munro, J. A., *J. Econ. Entomol.*, **36**, 769 (1943).
22. Nelson, W. L., "Petroleum Refinery Engineering," 4th ed., McGraw-Hill, New York, 1958.
23. Nichols, R. L., *J. Geol.*, **47**, 290 (1939).
24. Parks, G. S., L. E. Barton, M. E. Spaght, and J. W. Richardson, *Physics*, **5**, 193 (Aug. 1934).
25. Reiner, M., "Deformation, Strain and Flow," Interscience, New York, 1960.
26. Robinson, H. A. and C. A. Peterson, *J. Am. Ceram. Soc.*, **27**, 129 (1944).
27. Rudenko, N. S. and L. V. Shubnikov, *Chem. Abst.*, **29**, 2040 (1935).
28. Schmidt, A. X. and C. A. Marlies, "Principles of High Polymer Theory and Practice," McGraw-Hill, New York, 1948.
29. Tordella, J. P., *Trans. Soc. Rheol.*, **1**, 203 (1957).
30. Trouton, F. T. and E. S. Andrews, *Phil. Mag.*, **7**, 347 (1904).
31. Wells, Jr., R. E. and E. W. Merrill, *Science*, **133**, 763 (1961).
32. Westover, R. F., "Processing Properties," p. 547 in Bernhardt, E. C., "Processing of Thermoplastic Materials," Reinhold, New York, 1959.

VISCOSITY SPECTRUM



Meet the Authors

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* R.T. = Room temperature

< 2.2 °K.

Helium, liquid II

6.8 x 10⁵

150

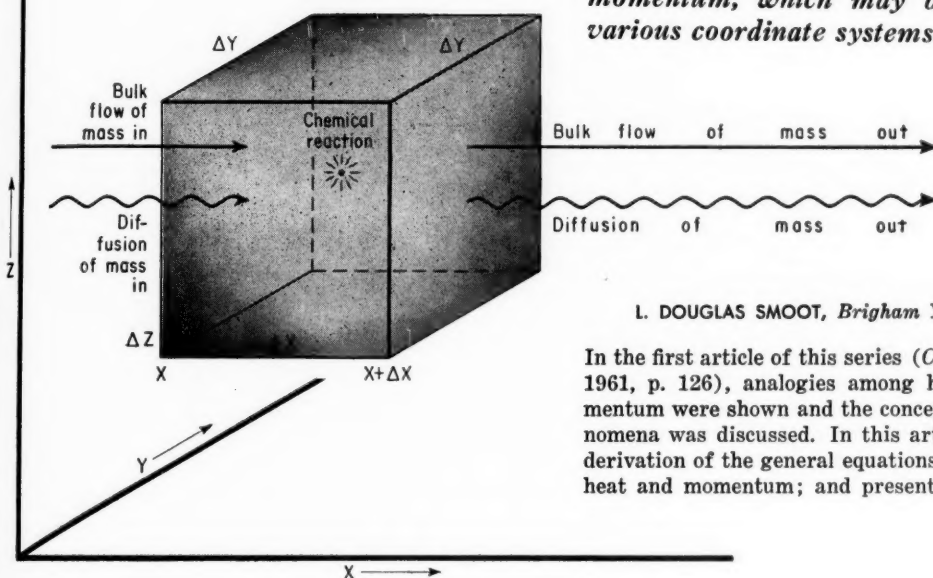
Alathon 3 polyethylene resin, melt (shear rate = 1 sec.⁻¹)

32

10⁻¹¹

Derive Your Own Transport Equations

Derivation of the transport equation for conservation of mass is typical of the development of like equations for energy and momentum, which may be expressed in various coordinate systems and by vectors.



L. DOUGLAS SMOOT, Brigham Young University

In the first article of this series (*Chem. Eng.*, Aug. 21, 1961, p. 126), analogies among heat, mass and momentum were shown and the concept of transport phenomena was discussed. In this article, we'll show the derivation of the general equations of change of mass, heat and momentum; and present these equations in

General equations for conservation of mass in various coordinate systems—Table I

Accumulation	Generation	Bulk Flow	Diffusion	Other
Rectangular coordinates				
$\frac{\partial C_A}{\partial t}$	$= R_A(x, y, z, t)$	$- \left(v_x \frac{\partial C_A}{\partial x} + v_y \frac{\partial C_A}{\partial y} + v_z \frac{\partial C_A}{\partial z} \right)$	$+ D_A \left(\frac{\partial^2 C_A}{\partial x^2} + \frac{\partial^2 C_A}{\partial y^2} + \frac{\partial^2 C_A}{\partial z^2} \right)$	$- \phi_A(x, y, z, t)$
Cylindrical coordinates				
$\frac{\partial C_A}{\partial t}$	$= R_A(r, \theta, z, t)$	$- \left(v_r \frac{\partial C_A}{\partial r} + v_\theta \frac{\partial C_A}{r \partial \theta} + v_z \frac{\partial C_A}{\partial z} \right)$	$+ D_A \left[\frac{\partial}{\partial r} \left(r \frac{\partial C_A}{\partial r} \right) + \frac{\partial^2 C_A}{r^2 \partial \theta^2} + \frac{\partial^2 C_A}{\partial z^2} \right]$	$- \phi_A(r, \theta, z, t)$
Spherical coordinates				
$\frac{\partial C_A}{\partial t}$	$= R_A(r, \theta, \phi, t)$	$- \left(v_r \frac{\partial C_A}{\partial r} + \frac{v_\theta \partial C_A}{r \partial \theta} + \frac{v_\phi \partial C_A}{r \sin \theta \partial \phi} \right)$	$+ D_A \left[\frac{\partial}{\partial r} \left(r^2 \frac{\partial C_A}{\partial r} \right) + \frac{\partial}{\partial \theta} \left(\sin \theta \frac{\partial C_A}{\partial \theta} \right) + \frac{\partial^2 C_A}{r^2 \sin^2 \theta \partial \phi^2} \right]$	$- \phi_A(r, \theta, \phi, t)$
Vector notation (independent of coordinate system)				
$\frac{\partial C_A}{\partial t}$	$= R_A$	$- \mathbf{V} \cdot \nabla C_A$	$+ D_A \nabla^2 C_A$	$- \phi_A$

Equations in table written for constant density and diffusion coefficient.

General equations for conservation of energy in various coordinate systems—Table II

Accumulation	Viscous Dissipation	Convection	Conduction
Rectangular coordinates			
$\rho C_p \frac{\partial T}{\partial t}$	$= \mu \phi_v$	$- \rho C_p \left(v_x \frac{\partial T}{\partial x} + v_y \frac{\partial T}{\partial y} + v_z \frac{\partial T}{\partial z} \right)$	$+ k \left(\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} + \frac{\partial^2 T}{\partial z^2} \right)$
Cylindrical coordinates			
$\rho C_p \frac{\partial T}{\partial t}$	$= \mu \phi_v$	$- \rho C_p \left(v_r \frac{\partial T}{\partial r} + \frac{v_\theta}{r} \frac{\partial T}{\partial \theta} + v_z \frac{\partial T}{\partial z} \right)$	$+ k \left[\frac{\partial}{\partial r} \left(r \frac{\partial T}{\partial r} \right) + \frac{\partial^2 T}{r^2 \partial \theta^2} + \frac{\partial^2 T}{\partial z^2} \right]$
Spherical coordinates			
$\rho C_p \frac{\partial T}{\partial t}$	$= \mu \phi_v$	$- \rho C_p \left(v_r \frac{\partial T}{\partial r} + \frac{v_\theta}{r} \frac{\partial T}{\partial \theta} + \frac{v_\phi}{r \sin \theta} \frac{\partial T}{\partial \phi} \right)$	$+ k \left[\frac{\partial}{\partial r} \left(r^2 \frac{\partial T}{\partial r} \right) + \frac{\partial}{\partial \theta} \left(\sin \theta \frac{\partial T}{\partial \theta} \right) + \frac{\partial^2 T}{r^2 \sin^2 \theta \partial \phi^2} \right]$
Vector notation (independent of coordinate system)			
$\rho C_p \frac{\partial T}{\partial t}$	$= \mu \phi_v$	$- \rho C_p (\mathbf{V} \cdot \nabla T)$	$+ k \nabla^2 T$

Viscous dissipation term, ϕ_v is given only generally here. Bird, Stawert, and Lightfoot¹ give a complete formulation. However, the term is rarely required.

Equations in table written for constant density and thermal conductivity.

various coordinate systems for use in later articles.

To fully appreciate the general nature of transport equations and better understand their uses and limitations, it is necessary to be familiar with their derivations. Since there isn't space to present derivations of all the equations of interest, and since the derivation of one is much like that of another, only the equation of conservation of mass will be developed.

Consider the stationary volume element of fluid of constant density (shown in the illustration for the rectangular coordinate system). For this element, we can write the law of conservation of mass at any given time:

$$\left(\begin{array}{c} \text{Net rate of} \\ \text{accumulation} \\ \text{of mass in} \\ \text{volume} \\ \text{element} \end{array} \right) = \left(\begin{array}{c} \text{Rate of} \\ \text{generation} \\ \text{of mass in} \\ \text{volume} \\ \text{element} \end{array} \right) - \left(\begin{array}{c} \text{Net rate of transfer} \\ \text{of mass by bulk} \\ \text{flow across the} \\ \text{element surface} \end{array} \right) - \left(\begin{array}{c} \text{Net rate of transfer} \\ \text{of mass by molecular} \\ \text{motion across the} \\ \text{element surface} \end{array} \right) - \left(\begin{array}{c} \text{Net loss of mass} \\ \text{across element} \\ \text{surface by other} \\ \text{means} \end{array} \right) \quad (1)$$

To represent Eq. (1) in algebraic symbols, consider a certain chemical component (species) A. Each of the five terms of Eq. (1) will be considered in order, and then combined to produce the general equation of conservation of mass. Let C_A be the concentration of species A in lb./cu. ft.

Accumulation—This term can be represented as the change of concentration of A with respect to time, multiplied by the elemental volume, $\Delta x \Delta y \Delta z$, as follows:

$$\frac{\partial C_A}{\partial t} (\Delta x \Delta y \Delta z), \text{ lb./hr.} \quad (2)$$

Rate of Generation—Generation of A in the volume

element could be by chemical reaction of any particular order, or nuclear reaction. To keep the equation general, the generation term is represented as a reaction rate, in lb./ (hr.) (cu. ft.) times the elemental volume:

$$R(x, y, z, t) \Delta x \Delta y \Delta z, \text{ lb./hr.} \quad (3)$$

The reaction rate, $R(x, y, z, t)$, is shown generally as a function of position and time. For a specific case, the actual reaction rate may be substituted in terms of the concentrations, once the kinetics of the problem are known.

Bulk Flow—The flux of species A [lb./ (hr.) (sq. ft.)] resulting from bulk flow can be represented by the bulk fluid velocity component, ft./hr. (v) in the direction being considered, multiplied by the concentration of species A. Then the rate of transport of A with time is the flux of A multiplied by the cross-sectional area normal to the direction of flow. For rectangular coordinates, the x , y and z directions are considered separately.

For the x -direction (shown in the illustration), the mass of A flowing into the $\Delta y \Delta z$ plane at x is:

$$v_x C_A \Big|_x \Delta y \Delta z \quad (4)$$

and that leaving the plane $\Delta y \Delta z$ at $x + \Delta x$ is:

$$v_x C_A \Big|_{x+\Delta x} \Delta y \Delta z \quad (5)$$

The net loss of A in the volume element, resulting from bulk flow in the x -direction, is the difference in the amount of A leaving and that entering for a unit of time, or Eq. (5) minus Eq. (4):

$$\left(v_x C_A \Big|_{x+\Delta x} - v_x C_A \Big|_x \right) \Delta y \Delta z \quad (6)$$

Eq. (6) is multiplied by $\Delta x / \Delta x$, and as Δx becomes small, a limit is considered:

General equations for conservation of momentum in various coordinate systems—Table III

Accumulation	External Forces	Bulk Flow	Viscous Diffusion
Rectangular coordinates			
<i>x</i> -component			
$\rho \frac{\partial v_x}{\partial t}$	$= -\frac{\partial P}{\partial x} + \rho g_x$	$= \rho \left(v_x \frac{\partial v_x}{\partial x} + v_y \frac{\partial v_x}{\partial y} + v_z \frac{\partial v_x}{\partial z} \right)$	$+ \mu \left(\frac{\partial^2 v_x}{\partial x^2} + \frac{\partial^2 v_x}{\partial y^2} + \frac{\partial^2 v_x}{\partial z^2} \right)$
<i>y</i> -component			
$\rho \frac{\partial v_y}{\partial t}$	$= -\frac{\partial P}{\partial y} + \rho g_y$	$= \rho \left(v_x \frac{\partial v_y}{\partial x} + v_y \frac{\partial v_y}{\partial y} + v_z \frac{\partial v_y}{\partial z} \right)$	$+ \mu \left(\frac{\partial^2 v_y}{\partial x^2} + \frac{\partial^2 v_y}{\partial y^2} + \frac{\partial^2 v_y}{\partial z^2} \right)$
<i>z</i> -component			
$\rho \frac{\partial v_z}{\partial t}$	$= -\frac{\partial P}{\partial z} + \rho g_z$	$= \rho \left(v_x \frac{\partial v_z}{\partial x} + v_y \frac{\partial v_z}{\partial y} + v_z \frac{\partial v_z}{\partial z} \right)$	$+ \mu \left(\frac{\partial^2 v_z}{\partial x^2} + \frac{\partial^2 v_z}{\partial y^2} + \frac{\partial^2 v_z}{\partial z^2} \right)$
Vector notation (independent of coordinate system, all three components)			
$\rho \frac{\partial \mathbf{V}}{\partial t}$	$= -\nabla P + \rho \mathbf{g}$	$= \rho \mathbf{V} \cdot \nabla \mathbf{V}$	$+ \mu \nabla^2 \mathbf{V}$
Cylindrical coordinates			
<i>r</i> -component			
$\rho \frac{\partial v_r}{\partial t}$	$= -\frac{\partial p}{\partial r} + \rho g_r$	$= \left(v_r \frac{\partial v_r}{\partial r} + \frac{v_\theta}{r} \frac{\partial v_r}{\partial \theta} - \frac{v_\theta^2}{r} + v_z \frac{\partial v_r}{\partial z} \right)$	$+ \mu \left[\frac{\partial}{\partial r} \left(\frac{\partial}{\partial r} (rv_r) \right) + \frac{\partial^2 v_r}{r^2 \partial \theta^2} - \frac{2}{r^2} \frac{\partial v_\theta}{\partial \theta} + \frac{\partial^2 v_r}{\partial z^2} \right]$
<i>θ</i> -component			
$\rho \frac{\partial v_\theta}{\partial t}$	$= -\frac{1}{r} \frac{\partial p}{\partial \theta} + \rho g_\theta$	$= \left(v_r \frac{\partial v_\theta}{\partial r} + \frac{v_\theta}{r} \frac{\partial v_\theta}{\partial \theta} + \frac{v_r v_\theta}{r} + v_z \frac{\partial v_\theta}{\partial z} \right)$	$+ \mu \left[\frac{\partial}{\partial r} \left(\frac{\partial}{\partial r} (rv_\theta) \right) + \frac{\partial^2 v_\theta}{r^2 \partial \theta^2} + \frac{2}{r^2} \frac{\partial v_r}{\partial \theta} + \frac{\partial^2 v_\theta}{\partial z^2} \right]$
<i>z</i> -component			
$\rho \frac{\partial v_z}{\partial t}$	$= -\frac{\partial p}{\partial z} + \rho g_z$	$= \left(v_r \frac{\partial v_z}{\partial r} + \frac{v_\theta}{r} \frac{\partial v_z}{\partial \theta} + v_z \frac{\partial v_z}{\partial z} \right)$	$+ \mu \left[\frac{\partial}{\partial r} \left(r \frac{\partial v_z}{\partial r} \right) + \frac{\partial^2 v_z}{r^2 \partial \theta^2} + \frac{\partial^2 v_z}{\partial z^2} \right]$

Equations for spherical coordinates are not shown here but are given by Bird, Stewart and Lightfoot.¹ Equations in table written for Newtonian fluids, constant density and viscosity.

$$\lim_{\Delta x \rightarrow 0} \left(v_x C_A \Big|_{x+\Delta x} - v_x C_A \Big|_x \right) \Delta x \Delta y \Delta z \quad (7)$$

Since the term in parentheses is the derivative of $v_x C_A$ with respect to x , Eq. (7) becomes:

$$\frac{(\partial v_x C_A)}{\partial x} \Delta x \Delta y \Delta z, \text{ lb./hr.} \quad (8)$$

By an analogous procedure, the net losses of A by bulk flow in the y - and z -directions are represented by:

y-direction:

$$\frac{(\partial v_y C_A)}{\partial y} \Delta x \Delta y \Delta z, \text{ lb./hr.} \quad (9)$$

z-direction:

$$\frac{(\partial v_z C_A)}{\partial z} \Delta x \Delta y \Delta z, \text{ lb./hr.} \quad (10)$$

The total loss of species A by bulk flow across the bounding surfaces is the sum of losses in the x , y and z directions:

$$\left[\frac{\partial (v_x C_A)}{\partial x} + \frac{\partial (v_y C_A)}{\partial y} + \frac{\partial (v_z C_A)}{\partial z} \right] \Delta x \Delta y \Delta z \quad (11)$$

Diffusion—The flux of A by molecular diffusion can be written using Fick's first law. For the x -direction, this equation is:

$$J_A = -D_A \frac{\partial C_A}{\partial x}, \text{ lb./hr. (sq. ft.)} \quad (12)$$

Again, the rate of transport of A with time is the flux multiplied by the cross-sectional area normal to the direction of diffusion. For the x -direction shown in the illustration, the mass of A diffusing across plane $\Delta y \Delta z$ per unit time at x is:

$$-D_A \frac{\partial C_A}{\partial x} \Big|_x \Delta y \Delta z \quad (13)$$

Similarly, at $x+\Delta x$:

$$-D_A \frac{\partial C_A}{\partial x} \Big|_{x+\Delta x} \Delta y \Delta z \quad (14)$$

The net loss of component A in the volume element by diffusion is the difference in the quantity per unit time leaving and that entering:

$$- \left(D_A \frac{\partial C_A}{\partial x} \Big|_{x+\Delta x} - D_A \frac{\partial C_A}{\partial x} \Big|_x \right) \Delta y \Delta z \quad (15)$$

As before, by multiplying by $\Delta x/\Delta x$ and allowing Δx to become very small, Eq. (15) becomes:

$$-\frac{\partial}{\partial x} \left(D_A \frac{\partial C_A}{\partial x} \right) \Delta x \Delta y \Delta z, \text{ lb./hr.} \quad (16)$$

Similarly, for the y and z directions:

y -direction:

$$-\frac{\partial}{\partial y} \left(D_A \frac{\partial C_A}{\partial y} \right) \Delta x \Delta y \Delta z, \text{ lb./hr.} \quad (17)$$

z -direction:

$$-\frac{\partial}{\partial z} \left(D_A \frac{\partial C_A}{\partial z} \right) \Delta x \Delta y \Delta z, \text{ lb./hr.} \quad (18)$$

Total net losses by diffusion across the bounding surfaces of the element are the sum of losses in the x, y and z directions.

$$-\left[\frac{\partial}{\partial x} \left(D_A \frac{\partial C_A}{\partial x} \right) + \frac{\partial}{\partial y} \left(D_A \frac{\partial C_A}{\partial y} \right) + \frac{\partial}{\partial z} \left(D_A \frac{\partial C_A}{\partial z} \right) \right] \Delta x \Delta y \Delta z \quad (19)$$

If transport of mass by eddy diffusion is included, and if it is represented by Fick's first law, then the terms representing this quantity would be exactly like Eq. (19), with the molecular diffusivity D_A replaced by the eddy diffusivity E_A .

Other Mechanisms—This term is included in a general form to account for other mechanisms of mass transport that have not already been included:

$$\phi(x, y, z, t) \Delta x \Delta y \Delta z, \text{ lb./hr.} \quad (20)$$

where $\phi(x, y, z, t)$ is the net loss of species A per unit volume by any particular mechanism. An example would be mass transfer between phases. If no means of mass transfer are considered other than bulk flow, molecular or eddy diffusion, or chemical reaction, this term is omitted.

By combining the terms of Eqs. (2), (3), (11), (19) and (20) in the order specified by Eq. (1), the general equation of conservation of mass is obtained:

$$\frac{\partial C_A}{\partial t} = R(x, y, z, t) - \left[\frac{\partial}{\partial x} (v_x C_A) + \frac{\partial}{\partial y} (v_y C_A) + \frac{\partial}{\partial z} (v_z C_A) \right] + \left[\frac{\partial}{\partial x} \left(D_A \frac{\partial C_A}{\partial x} \right) + \frac{\partial}{\partial y} \left(D_A \frac{\partial C_A}{\partial y} \right) + \frac{\partial}{\partial z} \left(D_A \frac{\partial C_A}{\partial z} \right) \right] - \phi(x, y, z, t) \quad (21)$$

Notice that the element volume $\Delta x \Delta y \Delta z$ was cancelled from each term. This equation has been developed in a very general way and thus can be applied to a large number of specific problems.

Eq. (21) can also be written in cylindrical and spherical coordinate systems. Two methods can be used to obtain these equations. Eq. (21) can be transformed from one system to another as shown by Mickley, Sherwood and Reed.² Alternatively, the equation can be derived by starting with a volume element in the desired coordinate system. The equation of conservation of mass in rectangular, cylindrical and spherical coordinates is shown in Table I. The equation is also shown in vector notation, which is independent of any coordinate system.

The corresponding equations of conservation of energy and of momentum are shown in Tables II and

III respectively. It has already been pointed out that the derivation of each of these equations is much like that shown for Eq. (21). A careful study of the above derivation should give the reader a better understanding of these equations, their limitations and their applications. Specific examples using these equations will be given in a later article in this series.

Bird, Stewart and Lightfoot¹ present an extensive study of the transport equations, including those for multicomponent systems.

Nomenclature

C_A	Concentration of A , lb./cu.ft.
C_p	Heat capacity at constant pressure, cal./(g.-mole) ($^{\circ}\text{C}.$).
D_A	Diffusivity of A in a solution or mixture, sq.ft./hr.
E_A	Eddy diffusion coefficient of A in solution or mixture, sq.ft./hr.
g	Acceleration of gravity, ft./sec. ²
J	Flux of mass by diffusion, lb./(hr.)(sq.ft.).
k	Thermal conductivity, cal./(sec.)(cm.)($^{\circ}\text{C}.$).
P	Pressure, atm.
r, θ, ϕ	Spherical coordinates.
r, θ, z	Cylindrical coordinates.
R	Reaction rate, lb./(hr.)(cu.ft.).
T	Absolute temperature, $^{\circ}\text{K}.$
t	Time, hr.
v	Bulk flow velocity component, ft./hr.
V	Vector velocity (v_x, v_y, v_z), ft./hr.
x, y, z	Rectangular coordinates, ft.
Δ	A small change.
μ	Viscosity, poise or cp.
ρ	Density, g./cc.
ϕ	Rate of transport of mass by some general mechanism, lb./(hr.)(cu.ft.).
∇	Vector operator.

References

1. Bird, R. B., W. E. Stewart and E. N. Lightfoot, "Transport Phenomena," Wiley, New York, 1960.
2. Mickley, H. S., T. K. Sherwood and C. E. Reed, "Applied Mathematics in Chemical Engineering," McGraw-Hill, New York, 1957.

Meet
the
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$$qA + r_f \Delta H_f V \rho = \lambda 4.37 a P(M/T)^{1/2}$$

Practical Way to Size Safety Disks

Practical technique gives size of rupture disk necessary to insure proper tank venting in the case of fire and pressure buildup.

E. DISS, H. KARAM, C. JONES
Dow Chemical Co.

To many engineers, sizing frangible safety disks used on reaction vessels and storage tanks is something of a black art.

The question inevitably comes up in designing vessels or tanks: "What size safety disk should we use to relieve pressure buildup?" There are numerous ways to get the answer to this important question. We believe we have developed a practical, simple approach to sizing frangible safety disks, particularly disks used on storage tanks handling reactive materials.

The technique is based on some simplifying assumptions. But the basic method can be used for analyzing more-complex situations.

Technique Involves Heat Balance

Our technique for sizing frangible disks involves totaling the heat input (external from fire and internal heat formation); then setting this equal to, or less than, heat loss through evaporation. Thus, the latent heat loss through escaping gas must equal or exceed total heat input.

The general situation can be stated as:

$$\begin{aligned} &\text{Heat input} + \text{Heat of reaction} - \text{Heat capacity} - \\ &\quad (\text{Fire}) \quad \quad \quad (\text{Temp. rise}) \\ &\quad \quad \quad \text{Heat loss} = 0 \\ &\quad \quad \quad (\text{Escaping vapor}) \end{aligned}$$

Let's take the components of this equation one at a time to see what they are composed of.

Heat Input—Designated Q_f , this is heat from a fire under a storage tank. While the API has a standard for petroleum storage tanks, no national standard is available. Dow Chemical uses the values given in the table (right) for heat input factors. Here

$$Q_f = qA \quad (1)$$

where q is heat input factor and A is total surface of the tank.

Heat of Reaction—This can be calculated by a variety of methods. For a monomer solution

$$Q_r = r_f \Delta H_f V \rho \quad (2)$$

where r_f is lb. polymer/(lb. monomer) (min.); ΔH_f is heat of formation, Btu./lb.; V is monomer volume,

cu. ft.; ρ is density of the liquid monomer, lb./cu. ft.

Heat Capacity—The tabulation (below) lists heat input to the steel-tank contents, and we do not have to consider heat capacity of the tank steel. Where heat capacity of other materials of construction becomes important, it can easily be factored into the table.

Heat capacity of the liquid may be expressed as:

$$C = V c_p \rho \Delta t \quad (3)$$

Heat Loss—The heat loss from escaping vapor can be calculated as follows in units of Btu./min.:

$$Q_\lambda = w \lambda \quad (4)$$

The general equation can now be written as:

$$Q_f + Q_r - C/\theta - Q_\lambda = 0$$

At any given temperature, say the temperature at which the frangible disk ruptures, Δt is zero and $C = 0$. Therefore, substituting from Eqs. (1), (2) and (4):

$$qA + r_f \Delta H_f V \rho = w \lambda \quad (5)$$

Equation Based on ASME Formula

Let's assume 1 min. as our unit of time. Then the API-ASME empirical formula for vapor flow through a long-nozzle orifice is:

$$\begin{aligned} W &= 262 a P (M/T)^{1/2}, \text{ where } W \text{ is in lb./hr. throughput.} \quad (6) \\ w &= 4.37 a P (M/T)^{1/2}, \text{ where } w \text{ is in lb./min. throughput.} \end{aligned}$$

Substituting for w in Eq. (5):

$$qA + r_f \Delta H_f V \rho = \lambda 4.37 a P (M/T)^{1/2} \quad (7)$$

This is the equation used for sizing frangible disk areas. The area, a , will be large enough to prevent pressure rise in the vessel above pressure necessary to rupture the disk. However Eq. (6) or (7) should not be used for pressures below 15 psig.

Work an Example

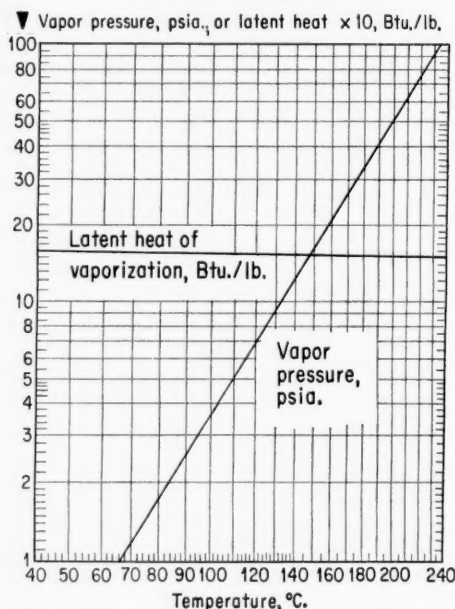
Styrene is to be stored in a 10-ft.-dia. x 36-ft.-long tank. If it is heated to about 115 C., it will start an

Heat input (fire) for steel tanks

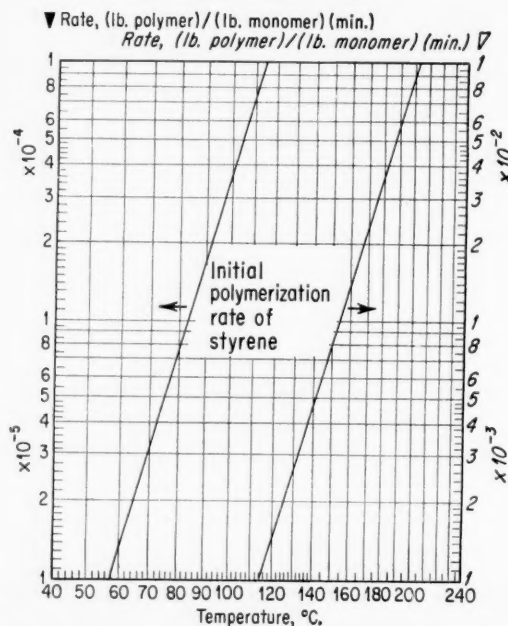
Tank Surface Area, Sq. Ft.	Btu./[Total Tank Surface in Sq. Ft.](Hr.)			
	Unsprinklered	Sprinklered	Water Spray	Insulated
100 or less	20,000	10,000	6,000	10,000
100 to 500	15,000	9,000	6,000	9,000
500 to 1,000	10,000	8,000	6,000	8,000
1,000 to 5,000	6,000	5,400	5,000	5,000
5,000 to 7,000	4,000	3,600	3,400	3,600

exothermic reaction. It forms polystyrene and liberates 300 Btu. per lb. of polymer formed. What size frangible should be used to protect the tank in the case of a fire?

Vapor pressure and latent heat for styrene—Fig. 1



Reaction rates for styrene give straight line—Fig. 2



Tank characteristics:

Hydrostatic test pressure =	50 psig.
Tank weight full of water =	220,500 lb.
Tank weight empty =	38,300 lb.
Water capacity =	182,200 lb.
Styrene monomer sp. gr. at 26 C. =	0.9
Styrene tank capacity = $0.9 \times 182,200$ =	164,000 lb.
Assume tank not filled over 85% full:	
Working styrene tank capacity =	140,000 lb.
$0.85 \times 164,000$ =	

Approximate tank surface area:

Cylinder $10 \pi 36$ =	1,165 sq. ft.
Ends $2 \pi 5^2$ =	157 sq. ft.
Total area =	1,322 sq. ft.

Fluid characteristics:

c_p , specific heat =	0.9 Btu./(lb.) (°C.)
ΔH_f , heat of formation, =	300 Btu./lb.
ρ , density at 26 C. = 0.9×62.4 =	56.2 lb./cu. ft.

A plot of vapor pressure of styrene vs. temperature will be found in Fig. 1. This information comes from "P-V-T Relationships of Organic Compounds," by R. R. Dreisbach, Handbook Pub., Sandusky, Ohio, 1952.*

Vessels are normally tested at $1\frac{1}{2}$ times the working pressure, P_w . Therefore:

$$\begin{aligned} P_w \times 1.5 &= 50 \text{ psig.} \\ P_w &= 33.3 \text{ psig.} \\ P (\text{absolute}) &= 33.3 + 14.7 = 48 \text{ psia.} \end{aligned}$$

From Fig. 1, the temperature, t , at 48 psia. = 196 C.

Calculate Heat and Reaction Input

Reaction rate vs. temperature information may be published in several forms. Let us plot:

$$r_t = \text{lb. polymer formed/(lb. monomer) (min.)}$$

On Cox Chart paper, this will usually result in a straight line. See Fig. 2 (Data from "Styrene, Its Polymers, Copolymers and Derivatives," by R. H. Boundy and R. F. Boyer, Reinhold, N. Y., 1952.)

From this curve, determine the reactivity at 196 C.

$$\begin{aligned} t &= 196 \text{ C.} \\ r_{196} &= 0.077 \text{ lb. polymer/(lb. monomer) (min.)} \end{aligned}$$

For heat input from fire Q_f , see the table. Let the unit time equal 1 min.

$$\begin{aligned} Q_f &= qA \\ A &= 1,322 \text{ sq. ft.} \\ q &= 6,000 \text{ Btu./(hr.) (sq. ft.)} = 100 \text{ Btu./(min.) (sq. ft.)} \\ Q_f &= 100 \times 1,322 = 132,200 \text{ Btu./min.} \end{aligned}$$

Heat of reaction at 196 C.

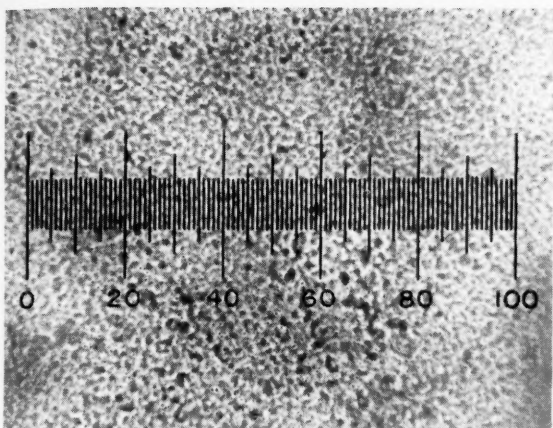
$$\begin{aligned} Q_r &= r_t \Delta H_f V_p \\ r_{196} &= 0.077 \text{ lb. polymer/(lb. monomer) (min.)} \\ \Delta H_f &= 300 \text{ Btu./lb.} \\ V_p &= 140,000 \text{ lb.} \\ Q_r &= 0.077 \times 300 \times 140,000 = 3,230,000 \text{ Btu./min.} \end{aligned}$$

Substituting in Eq. (7):

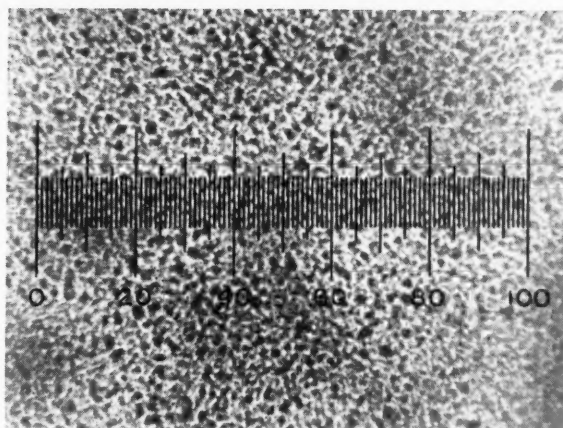
$$\begin{aligned} 132,200 + 3,230,000 &= 4.37 a P (M/T)^{1/2} \\ \lambda &= 150 \text{ Btu./lb. (Fig. 1)} \\ P &= 48 \text{ psia.} \\ M &= 104 \text{ (molecular wt. styrene)} \\ T &= (196 \text{ C.} \times 1.8) + 492 = 845 \text{ R.} \\ 3,362,200 &= 150 \times 4.37 a 48 (104/845)^{1/2} \end{aligned}$$

$$a = \frac{3,362,200}{150 \times 4.37 \times 48 \times 0.392}$$

* Now part of McGraw-Hill Book Co., New York.



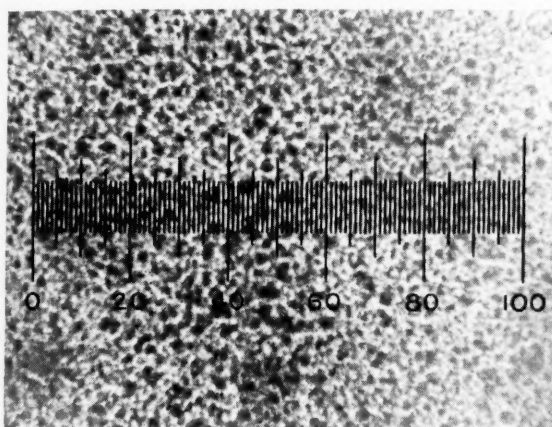
1 UNITEMP* LIME with controlled slaking to small uniform particle diameter.
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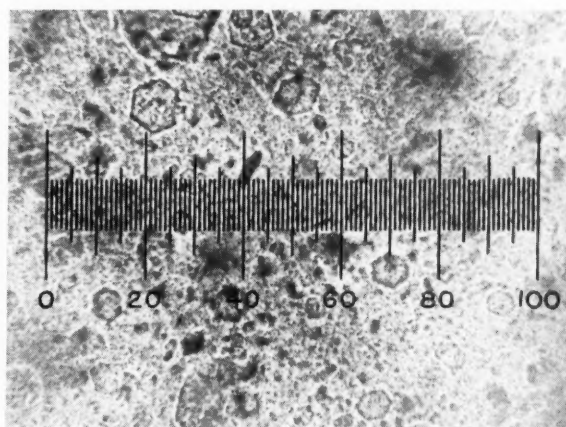
2 UNITEMP LIME with controlled slaking to medium uniform particle diameter.
SPECIFIC SURFACE . . . 45,300 cm²/g

The "art" of controlled slaking of calcium oxide explained in prize-winning paper

3 UNITEMP LIME with controlled slaking to larger uniform particle diameter.
SPECIFIC SURFACE . . . 38,125 cm²/g



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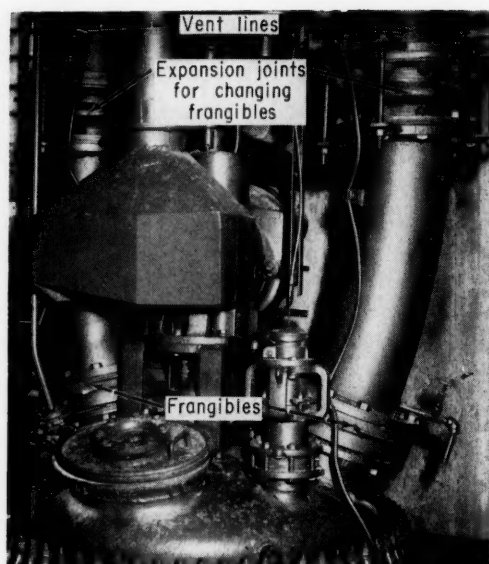
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Name _____

Company _____

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Unusual case: on 48-in.-dia. reaction vessel, two 12-in. vent lines with rupture disks.

$$D^2 = 274 \text{ sq. in.} = \pi D^2/4$$

$$D^2 = 349; D = 18.6 \text{ in.}$$

Under these conditions, the next largest standard-size frangible would be selected. For a lower relief pressure, the vent would be smaller.

Consider Assumptions Used

These calculations are based on a number of simplifying assumptions:

- Latent heat of vaporization assumed constant near frangible operating pressure. Also, all the reactant is present at relief temperature (this gives a "safe" disk size).
- No appreciable deviation in flow characteristics from Eq. (6).
- Uniform temperature of tank contents at any given time. No hot spots.
- Side reactions caused by temperature, other than the main reaction, are of no consequence. (If temperature generates products that can, in turn, cause a more rapid side reaction or even detonation, our procedure will not apply.)

Also, while our example and equations are based on protecting tanks that contain monomer solutions, the techniques can be applied to any chemical reaction that fits our underlying assumptions.

Other standards than those shown in the table could be used. They would depend on the specific installation and safety factors. And accuracy could be improved by using a specific flow equation instead of Eq. (6).

It might also be pointed out that on many reaction vessels and storage tanks two vent lines, each with a frangible, are installed. These lines are connected by a three-way plugcock. Porting of this valve is arranged

so that one vent line can be shut off while the other is exposed to the tank contents. If a frangible is ruptured, you can gain control of the contents, then shift the valve to the undamaged frangible. The ruptured disk can then be replaced without exposing the operating crew to hazardous fumes.

Nomenclature

a	Frangible area or net orifice area, sq. in.
A	Total surface area of vessel, sq. ft.
C	Total heat capacity of liquid, Btu.
C_1	Liquid heat capacity, Btu./°C.
c_p	Specific heat of fluid, Btu./(lb.)(°C).
ΔH_f	Heat of reaction or heat of formation, Btu./lb.
M	Molecular weight of fluid.
P	Relief pressure, psia.
q	Heat input factor, Btu./(sq. ft.)(min.).
Q	Total heat input, Btu./(min.).
r_r	Reaction ratio at any given temperature, lb. product/(lb. reactant)(min.).
t	Temperature, °C., at relief pressure.
Δt	Temperature change, °C.
T	Absolute temperature at relief pressure, °R.
w	Vapor flow through orifice, lb./min.
W	Vapor flow through orifice, lb./hr.
V	Normal working volume of tank, cu. ft.
θ	Time, min.
λ	Latent heat of vaporization at rupture pressure, Btu./lb.
ρ	Density of liquid, lb./cu. ft.

Subscripts

f	Fire.
r	Reaction.
t	Activity at a certain temperature.
λ	Latent heat.

Meet the Authors

EDWARD M. DISS is a project engineer in the process engineering group, Dow Chemical Co., Midland, Mich. His efforts are applied to process and equipment definition as well as engineering coordination of plastic-production facilities. In his ten years with Dow Chemical, he has worked in research and development, production, and engineering. Prior to joining Dow, he worked five years with Linde Air Products in development work. Diss has a B.S. in chemical and mechanical engineering from Purdue Univ. He is a member of ASME.

HENRY J. KARAM is a group leader in the plastics production laboratory of the Dow Chemical Co. He is responsible for basic studies on high polymers and has contributed much in this field. Of particular importance has been his work in fluid flow, physical properties, and development of test instruments. He has a B.S. in physics from Rensselaer Polytechnic Institute (1949) and an M.S. in physics from the University of Michigan (1950). He is a member of the Rheological Society and the Physical Society.

CLIFF JONES is a senior process engineer in one of the production plants at Midland. He follows the engineering of new construction in his area and handles production process improvements. He has had considerable experience in polymer research and process development, has been with Dow Chemical Co. for 15 years.

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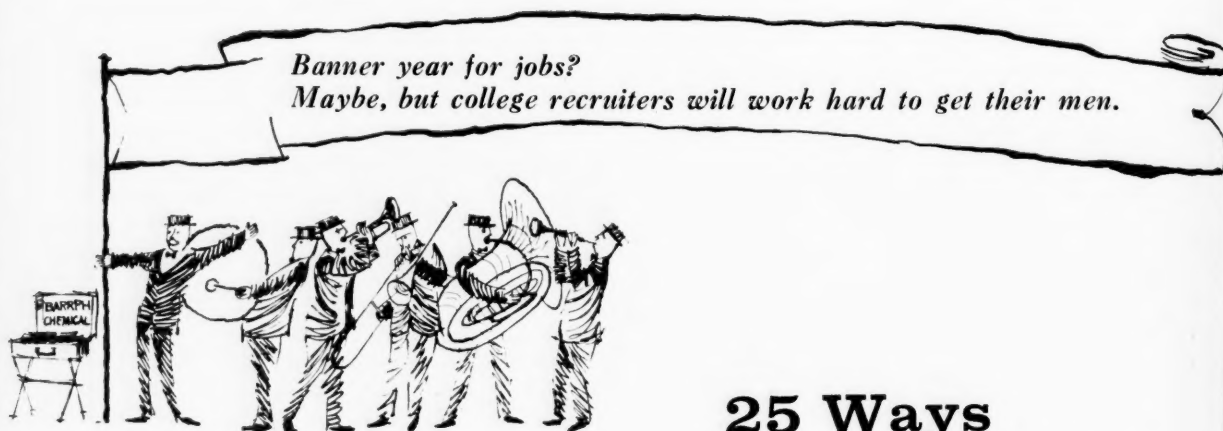
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25 Ways to Better Your Recruiting Skill

Leaving summer vacations behind, college seniors are this week heading back to the campus for a final round of courses before their graduation. Ahead of them, too: decisions about new jobs. And those decisions will be tempered sharply by their liaison to prospective employers, the campus recruiters.

Chances are, if you're an up-and-coming engineer in your company, that you'll be—or already have been—called on for campus recruiting duty. If that's the case, you can pick up some valuable tips from two new studies about how to recruit.* The independent work of the authors leads to many similar recommendations for more-potent recruiting.

Why do companies choose nonprofessional recruiters for the important first-contact work? P. W. Maloney, author of one of the studies, and assistant manager of employee relations at Esso Research & Engineering Co., answers it this way: "[Line people] can talk more intelligently with both student and professor. And because they have an intimate knowledge of what it takes to perform well in the company, they can do a better job of selection at the campus level."

Maloney recommends, however, that a program that mixes both personnel men and engineers is probably best. Even in such a mixed program, though, the main brunt of interviewing on the campus probably falls on the nonprofessional recruiter, that is, a young, successful engineer. So, what do you do?

Importance of Make-Ready

About a week before your trip to a campus, call the placement officer, find out if all is well. It's still not too late to arrange for extra help if the interviewing schedule is too heavy. And boo-boo's can occur: recruiting literature may not have arrived (send more by air express); your visit may not even have been announced!

You should also check your company and personal files for contacts at the school. If you write to these people ahead of time, they may tell suitable prospects of your visit. Another check should be made of the status of job candidates with whom the company already has contact. These might include previous summer employees, over-the-transom applicants, or graduate students your firm has approached previously.

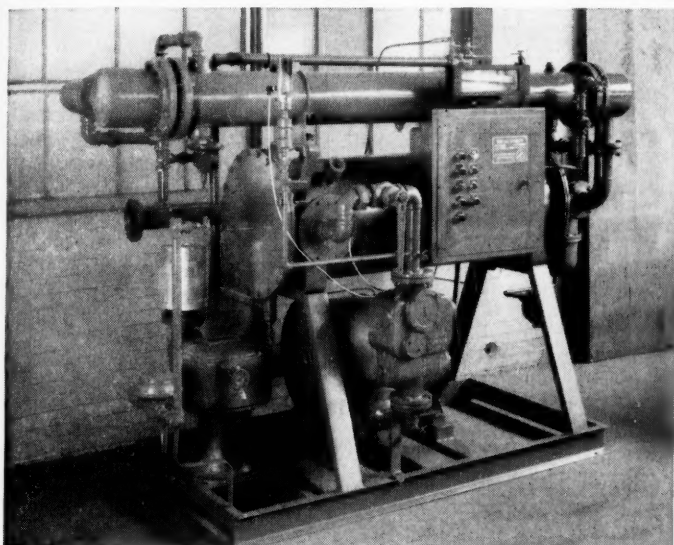
Take the job seriously. Though a central recruiting group in your firm may guide your work, you're the man on the spot—the company—to the students you interview, to placement officers and faculty members. Among your duties: check whether company literature is being disseminated properly, whether recruiting ads in campus publications produce inquiries, whether the recruiting team is the correct size for its job.

If you make your own travel arrangements, plan ahead. Your stay at the campus will be tough enough without facing a no-vacancy sign at all hotels when you arrive. And remember—homecoming, alumni meetings, spring festivals, all dry up empty guest space. Too, make sure you can get to the campus on time and can stay until you finish the scheduled inter-

* Odiorne, G. S., and Hann, A. S., "Effective College Recruiting," University of Michigan, Ann Arbor (1961) \$5.00; Maloney, P. W., "Management's Talent Search: Recruiting Professional Personnel," American Management Assn., New York (1961). \$4.50.

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views. Don't complacently believe that every air terminal in the country is as busy as New York, Chicago and Los Angeles.

Place of the Placement Office

When you arrive on campus, check in with the placement office right away. It's one more way to minimize last-minute hazards, and the placement officer will appreciate knowing where to contact you. In fact, your home base may have already sent you a message through him.

Typically, according to an imaginary day reported by Odiorne and Hann, the placement officer will be on the firing line from 8 am. to 6 pm., with more of the same the next day and the next, throughout the interviewing season. Though he tends to side with the students, he is a liaison officer; he probably wants to help you. Listen to him, particularly if you're new to this recruiting job. His hints and help can give you and your firm the extra bounce that's needed to meet the demanding pace and come up with good job candidates.

Work with, not against, the placement officer. While you may insist that things be done your way, a recruiter from another firm will not and his corporation may be met by favored treatment. Common business courtesies with the man who stands between you and a prospective employee will pay off, this year and next.

Nothing will mark you as a rube in campus recruitment quicker than asking the placement officer to help you land a top prospect. Today, most placement officers assume an essentially passive role. They help work out interview mechanics, provide space for the employer-student meetings, offer information related to their tasks. But they don't tamper with the marketplace—too many students and employers resent it if they do.

Since the recruiting competition is tough (the toughest may not even be your business competitors), questionable tactics occasionally arise. You'll do well to study the College Placement Council's "Principles and Practices of College Recruiting"—and put it into practice. This widely accepted guide to the responsibilities of recruiter, placement officer and student is appended

to Maloney's book and paraphrased in Odiorne and Hann.

One of the things you shouldn't forget in chatting with the placement officer is to ask about possible alumni candidates. Often, men out for several years will let placement officers (or faculty members) know of their job dissatisfaction. If you should follow up on these leads, it's important to keep the school officials informed of action so that they will keep in mind the kind of men you are looking for.

Make the Interview Count

Interviewing is the essence of your recruiting job. We can't do more than highlight it here, but you can learn something from Odiorne and Hann's study, which carefully analyzes actual interviews, or from another AMA book.* And, in any case, you'll learn better by doing than by reading about it. Your company's central recruiting staff probably will have included some practice interview sessions in training you for the job.

There are some tips, though, that may prove handy. With only a half-hour for the interview, be sure you don't hog the time. Interviews go best when you and the student share the allotted time equally. For your part, you have to welcome and put the candidate at



Seek alumni job-hunters • Conduct an informal interview

* Uhrbrock, R. S., "Recruiting the College Graduate: A Guide for Company Interviewers," American Management Assn., New York, 1953.



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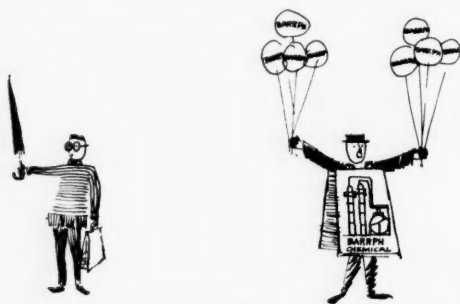
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Rights and Wrongs of Interviews

A consensus of recruiters at the University of Michigan turned up these wrongs:

- Asking pat questions of each student.
- Treating each student alike.
- Not unbending—firing questions as if you were a machine.

• Following a rigid check-list in asking questions.

The recruiters felt it is right, however, to:

- Follow a general plan for interviewing.
- Devise questions to fit the situation.
- Give the student his share of time to talk.
- Consider the student's individuality.

Part of the Michigan study also included a student evaluation of how well the recruiter did in the interview. Among the favorable impressions: the informal, relaxed (but businesslike) interview with good give-and-take. Among the unfavorable impressions: the tense, high-pressure (or disorganized) interview with no give-and-take.

Don't Forget Other Tasks

Your job on the campus focuses on the interview, and therefore on the placement office. But you shouldn't neglect the opportunity to represent your firm's interests elsewhere. Whether planned or informal, during your free periods, drop in to see members of the faculty. (They'll appreciate your setting up an appointment in advance.) Though you can't expect them to act as your agents, you can give them a feeling of the firm's present and future manpower needs. At the same time, you can evaluate the quality of next year's class, keep tabs on research of interest to your company. If you have a few summer jobs to offer students (or faculty), this is your chance to let it be known.

If this is your first year recruiting, its demands will tire and jade you. They tire and jade the veterans, too. But remember—in this job as in few others, *you are your company*. And first impressions really count.

BUTTERING UP THE BOSS (THE CASE OF THE FRESH ASPARAGUS)

This isn't do-it-yourself advice or a who-done-it! That title heads one of 30 case studies compiled by the American Management Assn. for first-line supervisors and foremen.*

According to Lydia Strong, executive editor of *Supervisory Management*, where these cases first appeared, each true study can form the basis for a discussion of possible solutions. The book can also be used, however, for self-study of your approach to the human relations problems that arise in supervision.

A Useful Format for Study

In the perforated-page book, each case fills about a page, backed up by a blank page to jot down ideas toward solution. No "answers" are provided because no unique solutions exist. But some suggested questions to arrive at a solution follow each narrated case.

To give you an idea of how effective this approach is in improving your own supervision, how would you handle this problem of buttering up the boss?

Bill Brown is a new foreman in the pigments division of the Colossal Chemicals Corporation. John Rowan, one of the long-service employees in his department, has a small farm and is proud of the produce he raises. He had made a practice of bringing the previous foreman a basket of his produce once a week.

Bill knows very well that these gifts had no bearing on the foreman's relationship with John. Nevertheless, John brought the gifts only to the foreman, and some of the other men in the department viewed this cynically. On several occasions in the past, Bill has heard such comments as "That's the way to get ahead in the department—bring the boss a basket of food." In fact, every time the previous foreman paid John a compliment on his work—no matter how well deserved—there were glances back and forth among the other workers, clearly spelling out "I told you so."

Bill was in hopes that the custom would stop when he took over the job of foreman; but it didn't. On the first warm day of the season, John brought Bill a large bunch of asparagus. "I cut it for you this morning—nice and fresh," he said with obvious pride.

Better think it over. If you haven't already met this situation (or others covered in this new book), you're sure to face it someday. But even if you have had a similar experience, chances are by thinking it through ahead of time you can handle it better next time.

* Strong, L., "Let's Get Down to Cases," American Management Assn., New York, 1961.

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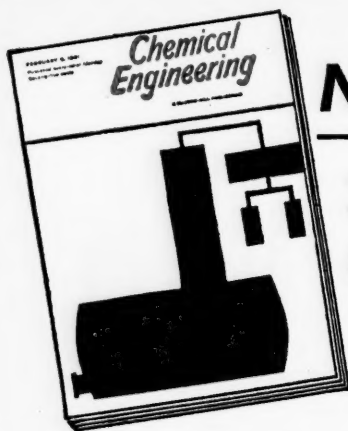
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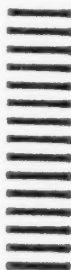
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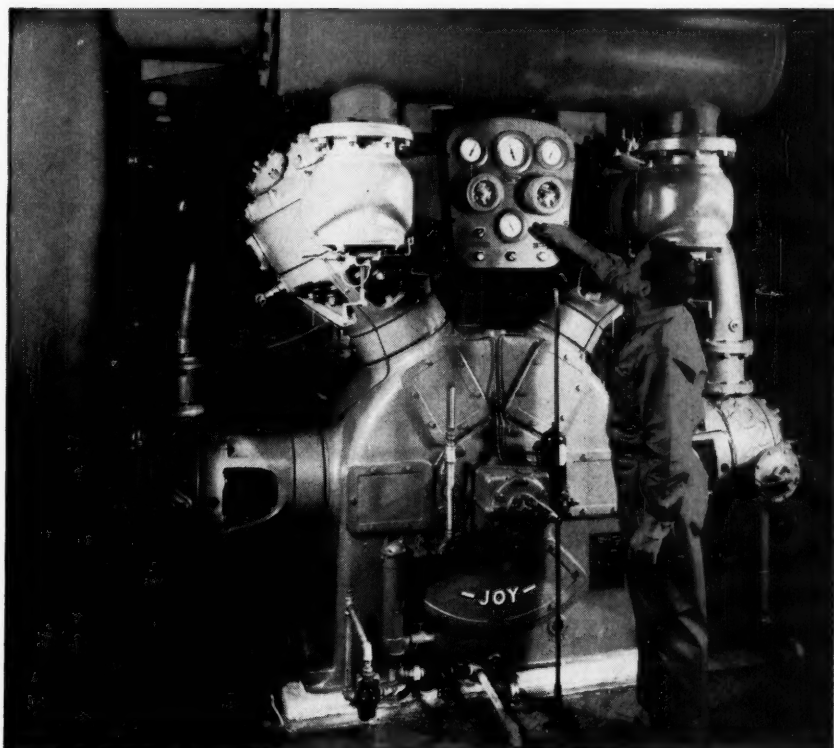
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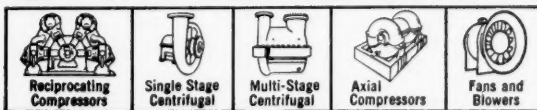
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A Chemistry Professor Tries His Hand at Plant Maintenance

Did you ever think of leaving your maintenance headaches behind and going into teaching? Here's the story of someone who did just the opposite—and didn't regret it.

CHARLES M. LOUCKS, Consultant



Until 1943, I had a nice clean, dignified profession. I was a college professor. Most of my life, I had been in and out of schools as a student and teacher of chemistry. I had a Ph.D. degree, but also had the frustrating feeling that I knew very little of chemistry as it was used in the everyday world.

I told students about how iron and steel is made, but I had never seen a steel mill, or watched the spectacular nighttime display of a Bessemer converter, or seen white-hot molten iron running from the tap hole of a blast furnace through the little troughs that carry it to the waiting ladle, with sparks flying in every direction. Nor had I seen an oil refinery or petrochemical plant, or a paper mill or rubber factory.

The water that came out when I opened the faucet was not entirely a stranger because chemists do use water and learn quite a lot about it. But I didn't know how much was involved to make it run out my faucet, or into the factories for industrial use. I knew nothing of corrosion as it affected lines, heat exchangers and boilers, and next to nothing about water treatment.

My learning was essentially book learning. How many chemistry teachers can say otherwise?

To change all that, I applied a rather extreme remedy. I got into the maintenance service business. One of the large chemical companies was offering industry a maintenance-contract service designed around the use of chemical compounds to restore plant equipment that had become fouled through corrosion,

scale formation, or decomposition of the product being manufactured. I accepted their offer of employment.

Your first impression may be that this was an awfully stupid thing to do—to leave a professorship just to clean other people's old dirty equipment. How undignified can you get?

However, I had few regrets. While it would be wrong to deny that there were a few times when I thought my move was a little stupid, 18 years later I find I can think of no other kind of work that would have provided a broader picture of how chemistry and people work together in real life, not in a book. And I found most of those years more challenging and enjoyable than anything that went before.

The First Two Days on the Job

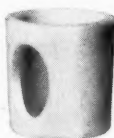
It was late November when I was sent to northern Ohio from down in the Southwest where I had been teaching school. It was turnaround time in one of the large refineries. Our job was to restore two or three dozen heat exchangers to normal by dissolving away the material fouling the surfaces of the tubes. This was to be done with truckloads of hydrochloric acid.

If I live to be a hundred, I'll never forget those two days.

There were three in our crew—one a high school kid and the other an adult who was a little less green than I was. It was wartime and help was hard to get. No

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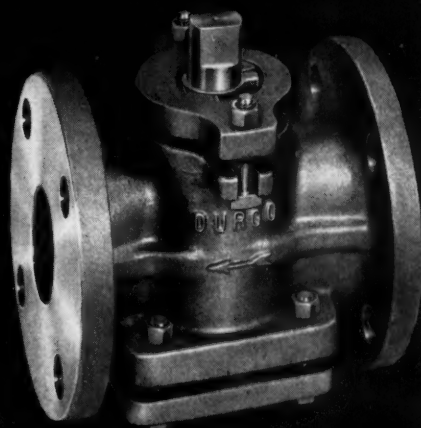
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YOU DON'T HAVE TO REPLACE YOUR VALVES OVER AND OVER AGAIN



one was experienced at this chemical cleaning service business anyway because it was very new. But plant downtime had to be cut to a minimum and the plant managers hoped this chemical method would save time. After all, that's what the salesman said. While he probably didn't know a heat exchanger from the kitchen stove, he knew that his acid would dissolve some of the substances that fouled heat exchange surfaces.

But none of this is what makes me remember my first assignment so well. I was cold. Have you ever been so cold that it's hard to imagine that you would ever live to be warm again? I had grown up on a farm way up in northern New York where it was nothing to hitch up the horse and cutter and drive four miles to school in 30 below zero weather. But I soon found out that a shut-down refinery in late November, with a strong northwest wind blowing snow so it traveled horizontally and hit you right in the face, can be much colder.

We had to dilute the acid with water, and we were everlastingly connecting and disconnecting our rubber hoses to little $\frac{3}{4}$ -inch connections on exchanger inlet and outlet nozzles, wading in water and mud with wet hands and wet gloves—and always in a hurry. The hurrying and the rubber safety clothing were all that saved my life.

A few days later, my fellow workman invited me to his home. We got down in the middle of the living room floor with the Sears Roebuck catalog and he was saying, "You will want two of these and one of these." The "these" were long-handled underwear, wool socks, wool shirts, pea jacket, and even a sheepskin vest. I had quite a list but I didn't wait for Messrs. Sears Roebuck to deliver by mail. I went to a nearby clothing store and laid in so many warm clothes, you would have thought I was planning to emigrate to the North Pole. I still have some of the items I bought that day 18 years ago.

Big Jack and the Little Plant Manager

It wasn't many days later, while I was still pretty green, that I had one of my most unusual experiences.

For the first time, I was sent out in full charge of the crew of three. We had hauled inhibited acid to Oil City to perform a pickling job on a piece of new equipment, which was considered something special because its tubes had been fabricated by a new welding operation. The manufacturer had specified that after the unit was installed it had to be pickled with 15% HCl.

The unit was a reboiler. I had been told that it would be a deisopropanizer reboiler, and I didn't know a deisopropanizer from a cracking still. When I got there, they said they had the unit all piped up and ready to have acid pumped in. So, when someone called it a deisobutanizer reboiler, that sort of went in one ear and out the other. I figured they knew what they were doing.

My audience included the plant manager and a big construction foreman named Jack, and on top of that

there was a man from the engineering department of the equipment supplier to see that this pickling job was done right. He was watching over that reboiler like a mother hen, and he was telling me very seriously, "Now the specifications say 15% HCl at 150 F. And when it says 15%, that doesn't mean 14 and it doesn't mean 16. Maybe I could allow $\frac{1}{2}\%$ either way but not more than that."

So when everyone was ready, we started pumping acid into the reboiler. I was analyzing samples like mad to keep close to 15%, and watching the temperatures, and I was pretty proud because being my first time in charge and all we were doing so well that I was sure Mr. Engineer would have no fault to find.

Then came the awful news. Just as we had completed filling the reboiler, Mr. Engineer came running to me with a voice full of dismay, "For Heaven's sake, stop! You are filling the wrong unit."

We weren't just filling, we were full. Up came the plant manager who was kind of small like me. Mr. Engineer wasn't any different. And big Jack, the construction foreman, joined us. He was just what you would expect a construction boss to look like—a husky, good-looking guy and just about a head taller than the other three of us. We each waited for someone else to break the ice. I guess the plant manager figured that since he was sort of host it was up to him, so he looked up at big Jack and said, "Well, Jack, it looks like we made a mistake." I can still see us standing there. Jack looked down at Mr. Manager as he replied in his big round resonant voice, "We, hell! You so-and-so, you told me to pipe up the wrong boiler. YOU made a mistake!"

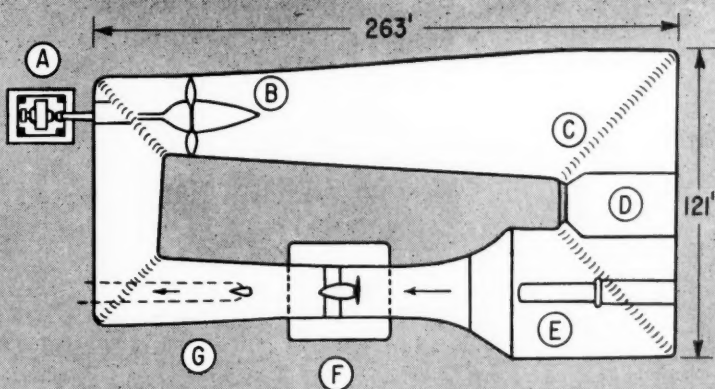
It was a little embarrassing, but a mistake had been made and it had to be rectified. We couldn't put the acid back in the truck tank because now that the acid had been diluted, there wasn't room. We couldn't throw it away because there wasn't enough strong acid left to mix another batch. So, what to do?

We left the acid where it was until Jack's crew had the right unit piped up. Then we managed to transfer the acid. By that time, it was dark and everyone else had gone home. But we still couldn't leave things like that. We had to rinse the acid-film out of the wrong unit, and put in a soda ash neutralizing solution.

The sacks of soda ash were in a warehouse a quarter of a mile away and, in the confusion, we had neglected to have them brought to our truck location. It was after midnight by that time, and had started pouring, with occasional thunder and lightning. We found a night watchman, got a key for the warehouse and three of us carried sacks of soda ash on our backs in the rain down to where the truck was hooked up to the temporary piping.

By the time we got the wrong unit fixed up, finished pickling the right one and got it washed out and neutralized, it was Wednesday morning. We had started Monday morning and I had stopped only long enough to eat. My crew had caught a few winks sleeping on the floor in one of the buildings where it

- (A) 18,000-hp. fan motor
- (B) Tunnel fan
- (C) Vanes
- (D) Tunnel heat-exchanger
- (E) Directional nozzle
- (F) Test section
- (G) Exhaust scoop



The challenge: How to remove the soot and paint from inside this huge wind tunnel quickly and safely.

was dry. This could have been another of those times when it seemed, even to me, that it was stupid to have quit the dignified profession of being a professor. But I wanted to see people and chemistry at work. I had seen people like big Jack and had seen chemistry at work even if I had to carry it in 100-lb. sacks on my back through the rain.

The Wind Tunnel

If I don't stop talking about working all day and night, and shivering in the cold and rain, you will surely conclude that I wasn't very bright, so it's high time to talk about the more creative and challenging aspects of the work.

In one sense, all maintenance work demands creative thinking because there is not much of the routine or production line aspect to it. Maintenance engineering is like medical engineering. Both involve anticipating trouble, keeping trouble from occurring and, should it occur, acting promptly to correct it. Not all the answers are in the books.

We encountered lots of problems that needed a unique approach. Perhaps the most unusual job we ever tackled was the cleaning of the inside surfaces of a big, high-altitude wind tunnel at a research laboratory. And when I say big, I'm not kidding. It formed a loop that was over 700 ft. in circumference. The smallest or venturi section was 20 ft. in dia. and the tunnel was as wide as 51 ft. in the heat exchanger section. Turning vanes, like venetian blinds standing on end, were in each corner, and in one leg were stacks of refrigeration coils.

The tunnel could be evacuated and cooled to simulate any high-altitude condition. Engines would be secured in the venturi section and run under flight conditions.

The inside surfaces of the tunnel were covered with oily soot from the engines. Beneath the soot were

the remains of two coats of paint—a red primer coat and a light colored top coat. The problem was to remove the oily film and one or both coats of paint, so that test models would not be eroded by flaked-off paint.

We had had some experience with nonflammable paint removers when we took paint off the hull of a lake freighter—which was quite an experience in itself. This was a methylene chloride type of remover, all doctored up with activators, evaporation retarders, thickeners and soaps. This stuff would probably have done the job, because methylene chloride is a good solvent for oil and grease in addition to being a paint remover base. But to put scaffolding and men inside the tunnel to work in an atmosphere of CH_2Cl_2 didn't sound good.

So how could it be done from the outside? And was it necessary to have all seven or eight ingredients in the formula, or would one or two get the job done?

To get these answers, we built a small test chamber that we could press against one wall of the tunnel and hold in place by a brace against the opposite wall. In this test chamber, we could apply test solutions and observe what was happening through windows. These observations made us decide to use only methylene chloride.

Then, to apply it without getting in the tunnel, a system of rotating spray arms was installed at intervals along the top of the tunnel and piped to suitable location where pumping equipment could be placed. We tested the spray pattern with water to observe whether all areas of the inside surface were wetted.

There were questions about explosion hazards and all that sort of thing. While methylene chloride is considered to be nonflammable, some published data showed that a mixture of methylene chloride and air could be explosive within a certain composition and pressure range. We discussed this problem with explosion experts at the Bureau of Mines. It was their

conviction that limits of the compositions of explosive gas mixtures are a function of the size of the test chamber in which observations are made. In other words, to know for sure whether a mixture of air and methylene chloride in the wind tunnel would be explosive, one would need a test chamber the size of the wind tunnel.

The laboratory agreed to make some tests of its own and reach a decision. The final verdict was that the possibility of an explosive mixture was extremely remote; but to make the thing even more remote, we would load the tunnel with CO_2 before putting the methylene chloride in.

We then had to estimate how much methylene chloride would be needed. A lot would evaporate, but by calculating the volume of the tunnel and looking up vapor pressure and temperature data, we could estimate the amount. There also had to be enough liquid phase to fill the pipe system, wet the surfaces and run back to a low spot where liquid could be picked up to be recirculated. We finally estimated that three railroad tank car loads of methylene chloride were needed.

We had very carefully removed all water from the floor of the tunnel after water-testing the spray system. Everything was ready to go. We decided to wait until after five o'clock when there would be a minimum of people and activity elsewhere on the grounds. The tunnel was sealed. Several truck loads of CO_2 were introduced and we started pumping methylene chloride through the spray system.

And, do you know, for a few hours we had the biggest darn refrigerator in the world. Since methylene chloride evaporates readily and acts as a refrigerant, we knew there would be a drop in temperature. That is why we so carefully removed all the water we could find.

We did not have long to wait to find out just how much the temperature would drop. All the lines from the pump truck immediately became coated with frost. And inside the tunnel! Wow! Forty below zero.

The low temperature would not have done any harm had there been no moisture in the air. However, despite our efforts to have everything dry, we couldn't prevent some condensation when the temperature dropped that low. As a result, ice formed in the spray heads and they stopped functioning. So we decided to turn on the big fan, hoping that the energy supplied would cause the temperature to rise slowly. And each spray connection was disassembled (which could be done from the outside) and the ice removed.

Once the atmosphere inside was saturated with methylene chloride, there was no more refrigeration effect. The temperature began to rise and pretty soon we were out of trouble. That big fan supplied a lot of energy, since it was designed to simulate flight velocities past the test engines in the venturi section.

There were windows in this section, so one could look in and see what was going on. With the fan just sort of idling along, there was the hugest hurricane you ever saw. If velocities anything like that could have been maintained elsewhere in the tunnel, there would have been no need for spray systems.

Observations with the test box had indicated that prolonged exposure was not necessary. After the spray system had operated as intended for a couple of hours, we shut off the fan and cut off the supply of methylene chloride to the spray. The liquid methylene chloride that was recovered by draining at the low spot was hauled away to a local reclaiming plant.

We removed much of the vapor by evacuating the tunnel and wasting the vapor to the atmosphere, making sure it did not settle and remain in places of little or no air movement. By the time the regular employees returned to work in the morning, there was no evidence of the night before.

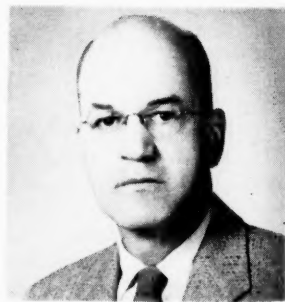
The results were considered to have been essentially what we had hoped for. The oil and grease were removed, as was much of the paint, particularly the top coat. This coat lay in shreds and small pieces along the bottom of the tunnel. A large manhole was cut in the tunnel at a point where a truck could be placed underneath, and several loads of paint shreds were removed.

The credit goes to the service company engineer who dared to tackle the job and be responsible for the planning and supervision, and to the wonderful cooperation and help from the people at the laboratory.

For me, it was one of the most interesting maintenance experiences. There was the challenge, the need for an unusual approach, the thrill of pioneering or doing something that had never been done before, and finally the satisfaction of having things turn out about as had been anticipated.

If this is the sort of thing that appeals to you also, then be glad you're in maintenance. Whether you work for a chemical cleaning outfit, or in the maintenance department of a processing company, the challenges and opportunities for creative engineering are almost unparalleled.

Meet the Author



CHARLES M. LOUCKS obtained his Ph.D. in 1937 and for the next six years taught chemistry at the University of Tulsa.

In 1943, he joined what is now the Dow Industrial Service Div. of Dow Chemical Co. Some of his early experiences as service engineer and district chemist are described in this article.

Dr. Loucks makes his home in Cleveland, Ohio, where he has been active as a consulting chemist for the past year.

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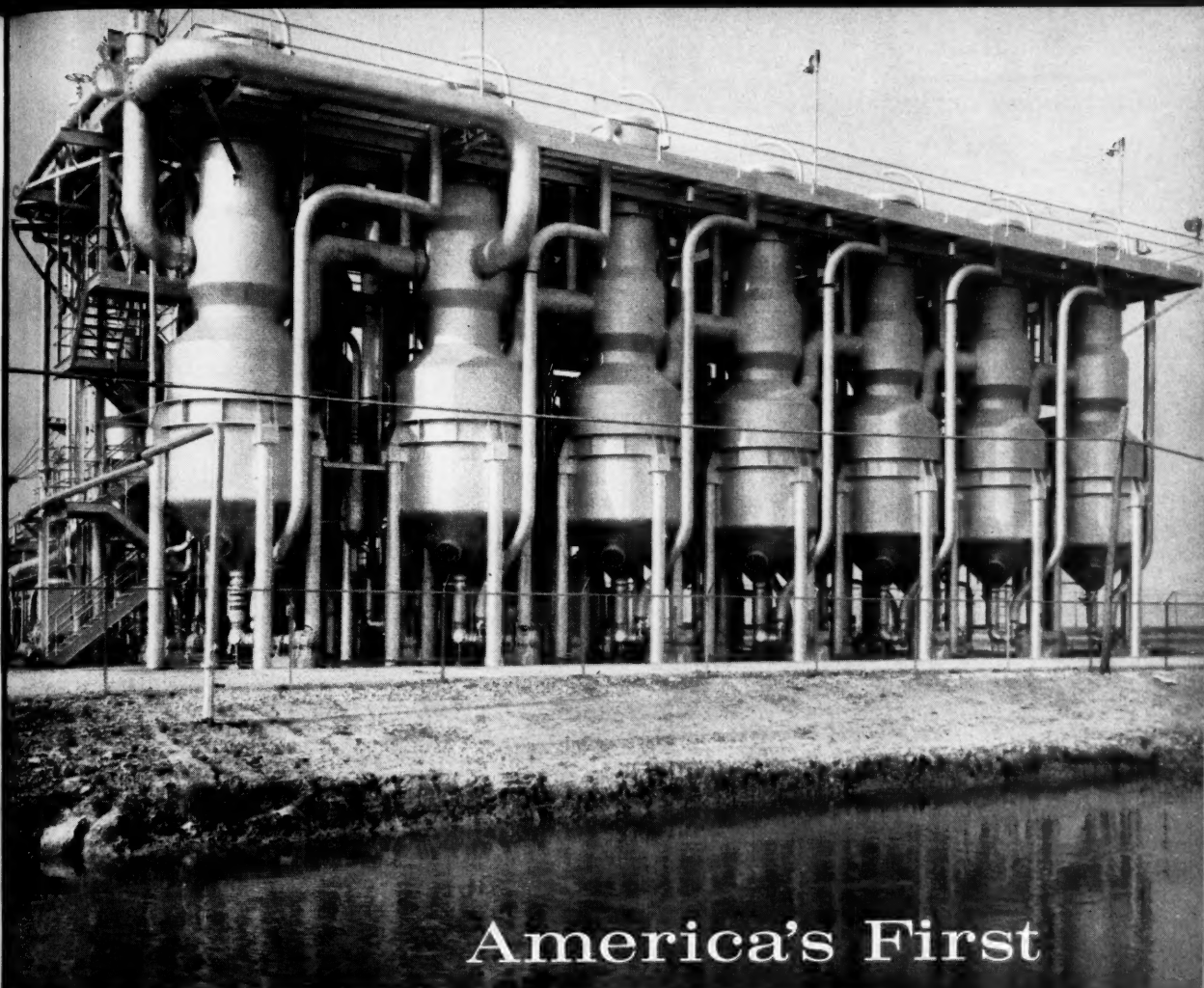
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Viton swivel-joint seal, removed (left) after 2 yr. exposure to solvents, chemicals, is in excellent condition after cleaning.

Specialty Rubbers for Special Uses-I

Design information for gaskets and seals made from the new heat- and chemical-resistant elastomers. Specific chemical resistance tables will appear in Part II.

Gaskets and seals are frequently trouble items in the chemical processing plant. Metals and plastics can be used to contain corrosive chemicals and solvents at most concentrations and temperatures, but finding elastic materials for gasketing and sealing presents much more of a problem.

Since the advent of synthetic rubbers, elastomer manufacturers have learned how to tailor their products to specific uses. As a consequence, there is a new and growing group of specialty elastomers that are helping to make life a little easier for the chemical engineer.

Most of these new special synthetic elastomers are expensive. And for the engineer just encountering these new materials, some are startlingly expensive. They may cost \$10-20/lb. (and

more) but they're cheap if they make the difference between a working process and a bright idea that can't get off the drawing board.

One point is certain—they are not cure-alls. They won't displace natural rubber or neoprene or buna in any of the places where these elastic materials will work. It's in the "problem" applications where they become indispensable.

What are these new elastomers? Two come from Du Pont—Viton and Hypalon. Viton is a copolymer of vinylidene fluoride and hexafluoropropylene. Hypalon, the cheapest rubber considered here, is a chlorosulfonated polyethylene.

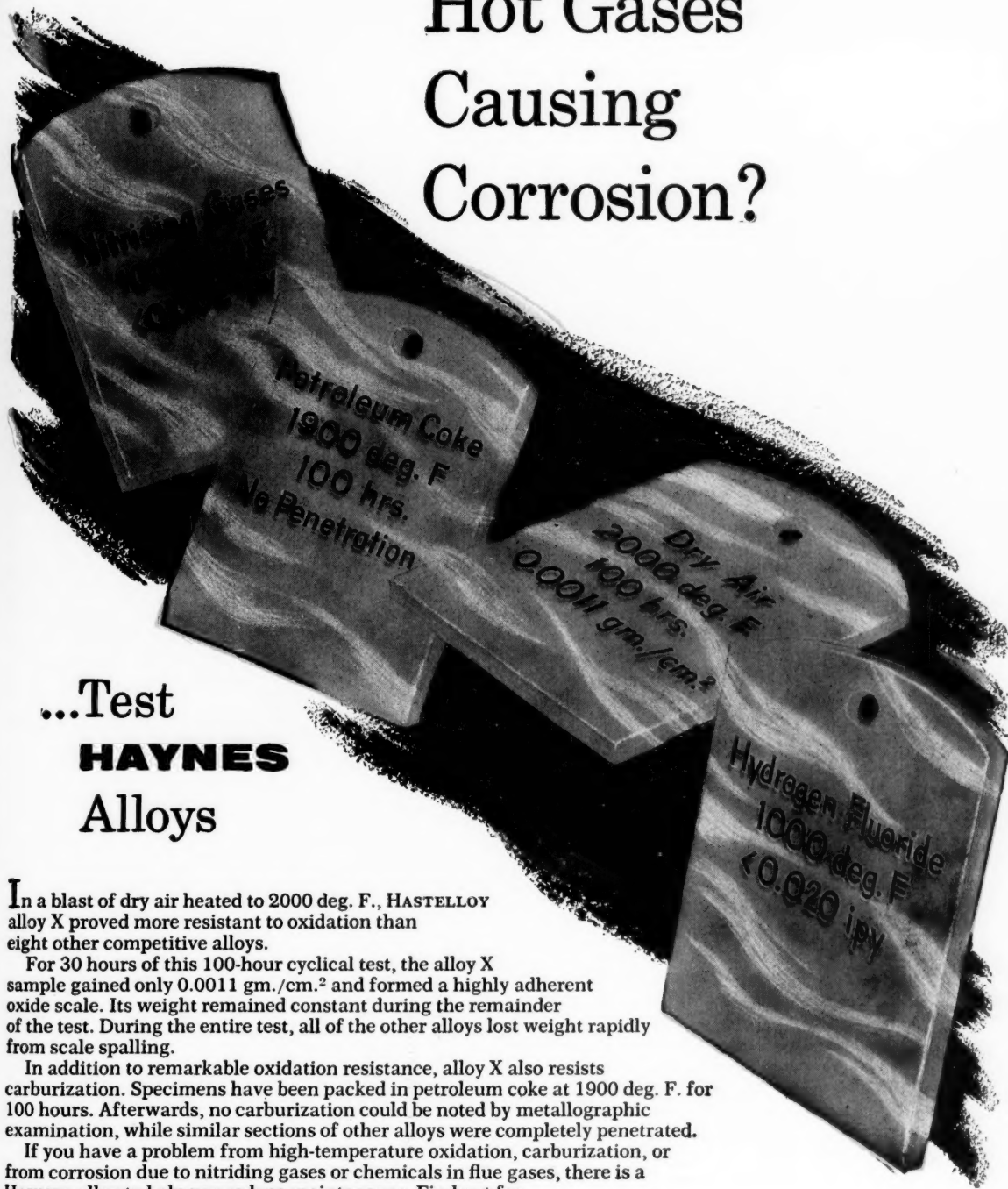
Minnesota Mining and Manufacturing Co. provides two more—Fluorel 2141 elastomer (formerly known as Fluorel elastomer) and Kel-F elastomer. Kel-F elastomer

is "a fully saturated halo fluorocarbon co-polymer of chlorotrifluoroethylene and vinylidene fluoride containing more than 50% fluorine by weight."

In addition, there are a number of specialty silicone rubbers made by such manufacturers as Dow Corning, General Electric and Union Carbide.

All of these materials may be compounded into elastomers of varying physical and chemical properties. In general, the manufacturer should be consulted concerning your particular problem. Even then, you may have to test several materials or compositions to determine the best one for your conditions. However, the information presented here will give you some idea as to whether there is any possibility of a material working in

Hot Gases Causing Corrosion?



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In a blast of dry air heated to 2000 deg. F., HASTELLOY alloy X proved more resistant to oxidation than eight other competitive alloys.

For 30 hours of this 100-hour cyclical test, the alloy X sample gained only 0.0011 gm./cm.² and formed a highly adherent oxide scale. Its weight remained constant during the remainder of the test. During the entire test, all of the other alloys lost weight rapidly from scale spalling.

In addition to remarkable oxidation resistance, alloy X also resists carburization. Specimens have been packed in petroleum coke at 1900 deg. F. for 100 hours. Afterwards, no carburization could be noted by metallographic examination, while similar sections of other alloys were completely penetrated.

If you have a problem from high-temperature oxidation, carburization, or from corrosion due to nitriding gases or chemicals in flue gases, there is a HAYNES alloy to help you reduce maintenance. Find out for yourself by testing them.

We'll gladly send you samples. But to make sure we send you the alloy or alloys most nearly suited to your need, we ask that you send a letter outlining your own particular conditions. If you would like to learn more about alloy X, ask for a copy of the booklet, "HASTELLOY Alloy X."

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Viton

Design Data

Hardness	60-95 Shore A
Tensile strength	Over 2,000 psi.
Temperature range	-40 F. to 600 F.
Abrasion resistance	Good
Chemical resistance	Excellent
Compression-set resistance	Very good
Oil resistance	Outstanding
Sun & weather resistance	Very good
Adhesion to fabrics	Good
Adhesion to metals	Good

your particular operating situation.

► **Viton**—According to Du Pont, Viton is valuable because of these properties:

- Dependable physical performance at temperatures of 400 F. and above.

- Resistance to most oils, chemicals, solvents and exotic fuels at temperatures of 400 F. and above.

- Good mechanical properties.

- Excellent resistance to ozone, oxygen and weathering.

In intermittent service, Viton resists temperatures up to 600 F. On the low end of the scale, it is serviceable down to -40 F., and in some applications has been satisfactory down to -65 F. Its mechanical properties include low compression set, high modulus of elasticity and good tensile strength. It has a low permeability to gases. Its resistance to chemicals is extremely good.

In general, Viton resists most acids, aliphatic and aromatic hydrocarbon solvents, lubricating oil, gasoline, and animal and vegetable oils. It has poor resistance to the oxygenated solvents (ketones, etc.) and to lacquer solvents.

Actual industrial applications include O-rings and seals on centrifuges handling chlorinated hydrocarbons (including methylene chloride), pumps for high-aromatics-content gasoline, and heat exchangers containing fatty acids at 525 F. Viton is used to gasket high-pressure steam lines and to seal pumps handling concentrated sulfuric acid, concentrated hydrochloric acids, and molten sulfur.

► **Fluorel 2141 Elastomer**—Made by Minnesota Mining and Manufac-

Fluorel 2141 Elastomer

Design Data

Hardness	65 Shore A
Tensile strength	2,300 psi.
Tear strength	180 lb./in.
Abrasion resistance	Good
Elongation	320%
Temperature range	-50 F. to 400 F.
Chemical resistance	Excellent
Oil resistance	Excellent
Ozone resistance	Excellent
Sun & weather resistance	Excellent

turing Co., Fluorel 2141 is similar in most ways to Du Pont's Viton. Its use is promoted for mechanical seals and sealants, wherever there is exposure to chemicals and great heat. It is rated by 3M for continuous long-time service at 400 F. "without marked degradation of either the molecular structure or mechanical properties of the polymer." For reduced exposure periods, under some conditions, temperatures above 600 F. can be tolerated. Thin sections can be bent without cracking at temperatures as low as -50 F.

The elastomer is highly resistant both to weathering in industrial atmospheres and to ozone. It is stated to have "excellent resistance to many hot oils, fuels, organic solvents, and strong acids and bases."

It is also noted for excellent resistance to compression set (see the

Kel-F Elastomer

Design Data

Hardness	55-65 Shore A
Tensile strength	16,000-35,000 psi.
Temperature range	-40 F. to 450 F.
Compression-set resistance	Excellent
Tear strength	150 to 300 lb./in.
Extensibility	300 to 600%
Chemical resistance	Excellent
Oil resistance	Good
Ozone resistance	Excellent
Sun & weather resistance	Very good

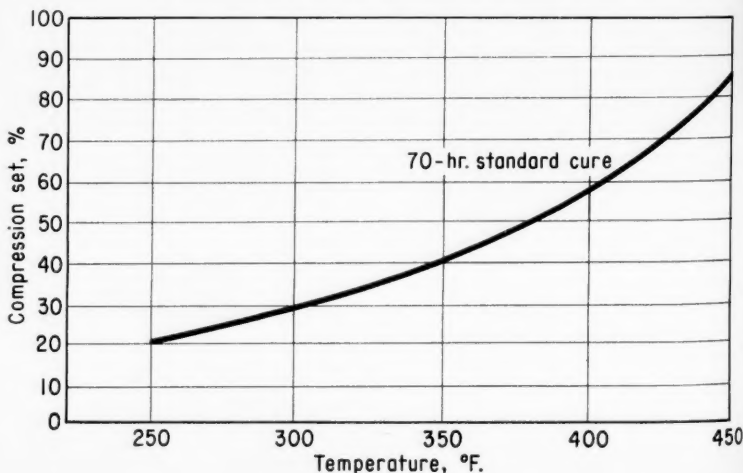
graph at the bottom of this page.)

► **Kel-F Elastomer**—Another 3M product, Kel-F elastomer, like the two elastomers described above has excellent thermal stability and is useful up to 400 F. Kel-F elastomer gum may be vulcanized in many ways, the two most promising using either a peroxide or amine cure. The properties of the vulcanizates depend on the cure used. In general, Kel-F elastomers are notable for their high tensile strength (1,600 to 3,500 psi.), extensibility (300 to 600%) and tear strength (150 to 400 lb./in.). Compression set measurements show values as low as 5% at 77 F., and 30% at 300 F. The material has excellent resistance to strong oxidizing acids, mineral acids, peroxides, alkalis, alcohols, aliphatic solvents, some chlorinated solvents, and silicone oils.

Kel-F elastomers have excellent

Fluorel elastomer has excellent compression properties

(According to ASTM D395-52T, Method B)



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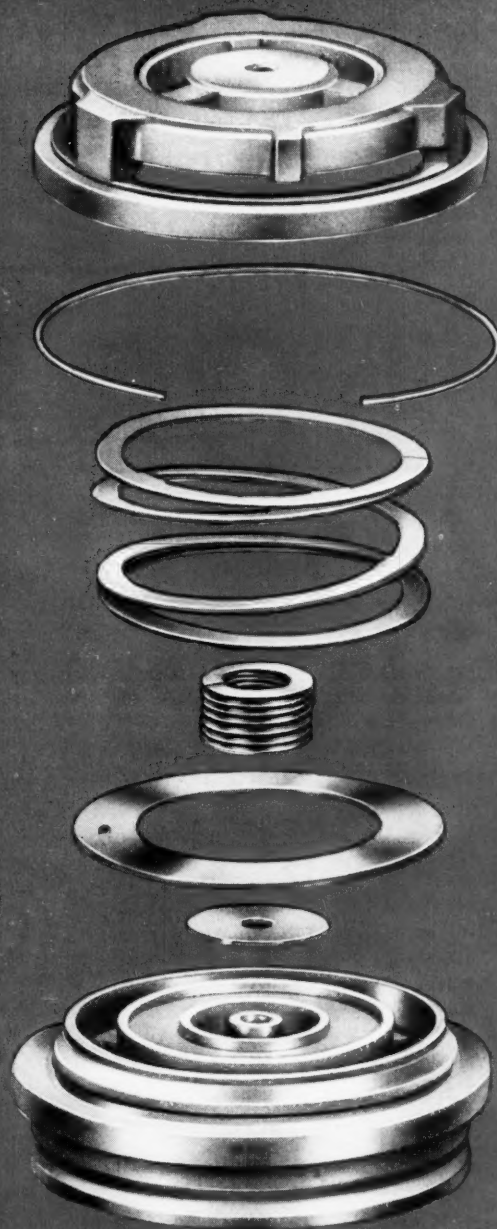


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PENNSYLVANIA COMPRESSORS

THE SECRET OF SUCCESS IS IN THIS "AERTYTE" VALVE DESIGN



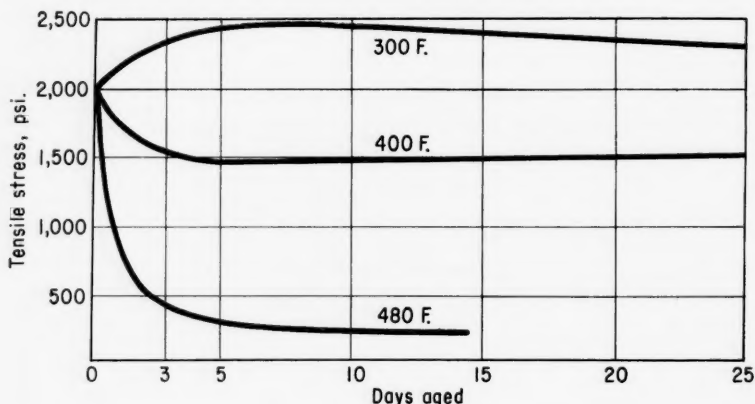
Pennsylvania Compressors run efficiently, quietly, with minimum maintenance... here's why.

Pennsylvania AERTYTE Disk Valves have no nuts, bolts, or screws to break or burn fast. You get longer valve life . . . reduced wear . . . quiet operation. Flat valve discs have no flexing or bending action to weaken or distort them; they remain perfectly flat and tightly seated over long periods of service.

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PENNSYLVANIA PUMP AND COMPRESSOR COMPANY
Easton, Pa. • Earning Customer Confidence Since 1920

Peroxide-cured Kel-F elastomer has good thermal stability



Silicone Rubber

Design Data

Hardness.....40-85 Shore A
Tensile strength.....Below 1,500 psi.
Temperature range....-150 F. to 500 F.
Chemical resistance.....Good
Compression-set resistance.....Fair
Heat-aging resistance.....Outstanding
Tear resistance.....Poor
Ozone resistance.....Excellent
Flame resistance.....Fair
Sun & weather resistance.....Very good

Hypalon

Design Data

Hardness.....40-95 Shore A
Tensile strength.....Over 3,000 psi
Temperature range....-80 F. to 350 F.
Chemical resistance.....Good to Excellent
Compression-set resistance.....Fair
Flame resistance.....Good
Oil resistance.....Good to Excellent
Ozone resistance.....Outstanding
Sun & weather resistance....Outstanding
Adhesion to metals.....Excellent



Hypalon plugs seal Pyrex glass tubes to tube sheet of acid fume condenser.

resistance to red fuming nitric acid.

► **Hypalon**—A Du Pont rubber, made by reacting polyethylene plastic with chlorine and sulfur, Hypalon is another elastomer having good resistance to heat, ozone and oxidizing chemicals. It is useful up to 350 F. and down to -80 F., somewhat lower than the other elastomers listed above.

It has outstanding resistance to oxidizing chemicals, heat, abrasion, sunlight and weathering, and is completely ozone-proof.

Hypalon is the cheapest of the five synthetic rubbers discussed here. Recent price cuts bring it to about 40¢/lb.—almost the same price as neoprene.

Although it isn't of much importance in the field of gaskets and seals, Hypalon is one of the few synthetic rubbers that can be compounded in any color.

► **Silicone Rubbers**—The silicone rubbers are available in a number of different types from several manufacturers. Although they have

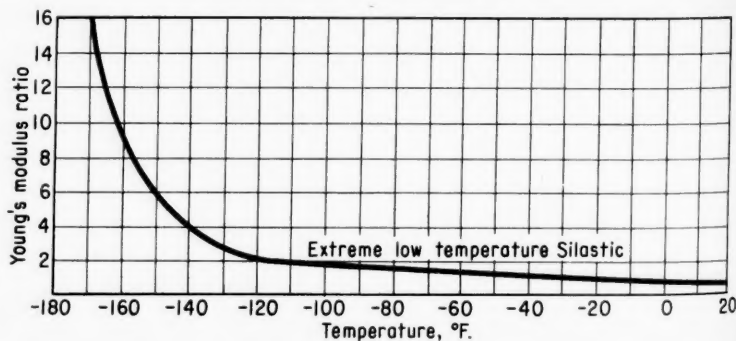
good resistance to fuels, oils and many solvents, they do not have the wide range of chemical resistance demonstrated by the other elastomers discussed. The upper temperature limit for these rubbers is about 500 F. The lower is well below any of the other elastomers discussed here — low-temperature silicone rubbers are useful down as low as

-130 F. In general, though, those having the lowest brittle points are less resistant to solvents than those that cannot be used at the lowest temperatures.

In the figure below, a ratio of 2 means the sample is twice as stiff as at room temperature. ("Silastic" is the trade name used by Dow Corning for its line of silicone rubbers.)

How cold affects stiffness of silicone rubber

(According to ASTM D797-46)

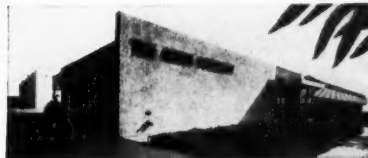
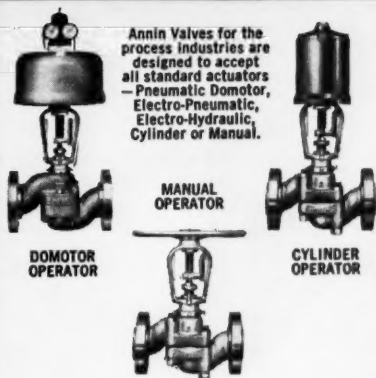


WHY ANNIN IS THE CHEMICAL INDUSTRY'S LEADING PRODUCER OF ALLOY CONTROL VALVES



... OVER \$1½ MILLION IN
ALLOY VALVE BODY PARTS
CARRIED IN STOCK

In specifying control valves, the Chemical Industry says make them *strong*, make them *light*, make them *versatile*, and by meeting these standards Annin has become the leading supplier of alloy valves for process control. The above photo, showing a portion of Annin's \$1½ million inventory of alloy body parts, is in itself only part of the story. Annin's split body construction... easily replaceable trim... the flexibility of angle, or 3-way bodies immediately supplied from stock... the reduction in overall weight without sacrifice of strength... are other factors in Annin leadership. You can benefit by the inventory economy, ease of maintenance, and basic design advantages of Annin Valves... recognized by control engineers and valve designers as the outstanding valve development of the past twenty-five years for the control of hot, cold, erosive, corrosive, or viscous fluids. Write today for General Catalog 1500-E.



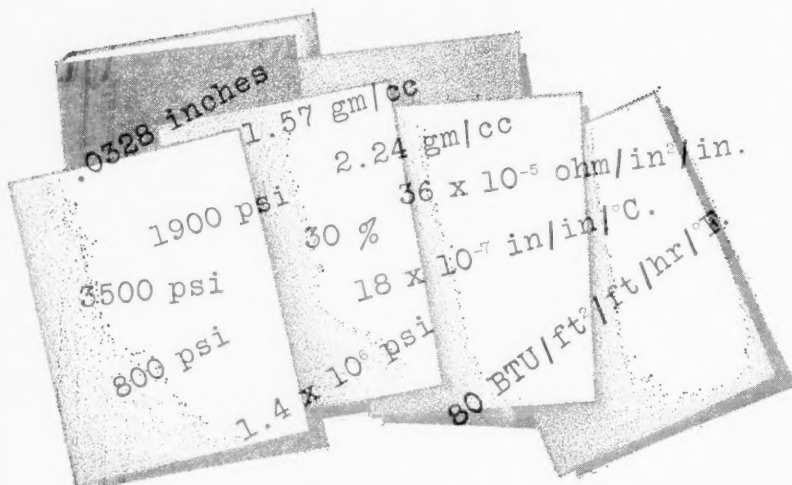
ANNIN VALVES

Products that work for your profit

THE ANNIN COMPANY
1040 So. Vail Ave., Montebello, Calif.

NEW TECHNICAL DATA SHEETS AVAILABLE TO GLC ANODE CUSTOMERS

Recently issued data sheets prepared by our Technical Department contain important information about graphite anode properties.



Among the typical physical properties detailed for anodes in various grades and sizes are maximum particle sizes... apparent and real density... porosity... resistivity... rupture... compressive and tensile strength... elasticity... thermal expansion and conductivity.

Typical chemical properties of the anode grades show percentages of ash, sulfur, silicon, iron, calcium, aluminum, vanadium sodium, titanium and other impurities.

Data on the surface finishing obtainable in various machining operations are also included.

We shall be happy to furnish a set of these technical data sheets, with our compliments, to anode users everywhere. Your request will be most welcome.

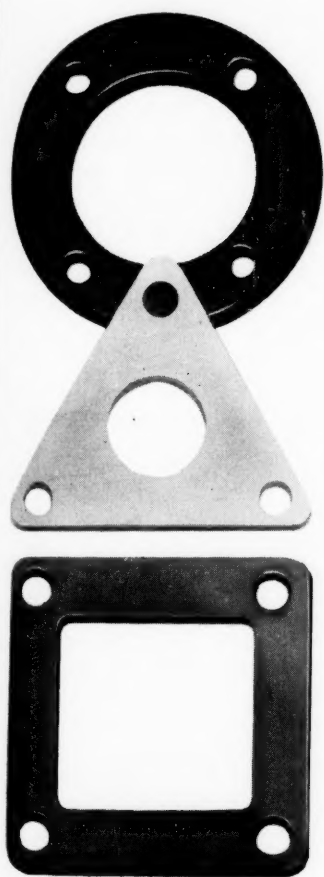


GREAT LAKES CARBON CORPORATION

18 EAST 48TH STREET, NEW YORK 17, N. Y.

WHY GASKETS OF ARMALON[®] HELP REDUCE MAINTENANCE COSTS • they're long-lasting

• resist harsh chemicals • withstand temperature extremes • cut replacement costs • reduce downtime



When you need new gaskets that must take all kinds of operational hazards in stride . . . be sure they're made of Du Pont "Armalon"™ TFE-fluorocarbon felts impregnated with "Teflon"™ resin.

These gaskets can take exposure to harsh chemicals at temperatures ranging from -320°F. to +550°F. and often wear up to 700% longer than those of ordinary materials. They've resisted 99.3% sulfuric acid at 200°C. for 18 months without default. In stainless-steel pipes carrying HNO₃ fumes at 170°C. and 97 psi, gaskets of this material have continued to function after 7 months!

Gaskets of "Armalon" are relatively soft, conform to uneven flanges with minimum pressures. A booklet containing more information about gaskets of "Armalon". . . uses and case histories will be sent on request. Mail coupon today.

™ "Armalon" is Du Pont's registered trademark for its TFE-fluorocarbon resin-impregnated felts
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**DU PONT INDUSTRIAL
COATED FABRICS**

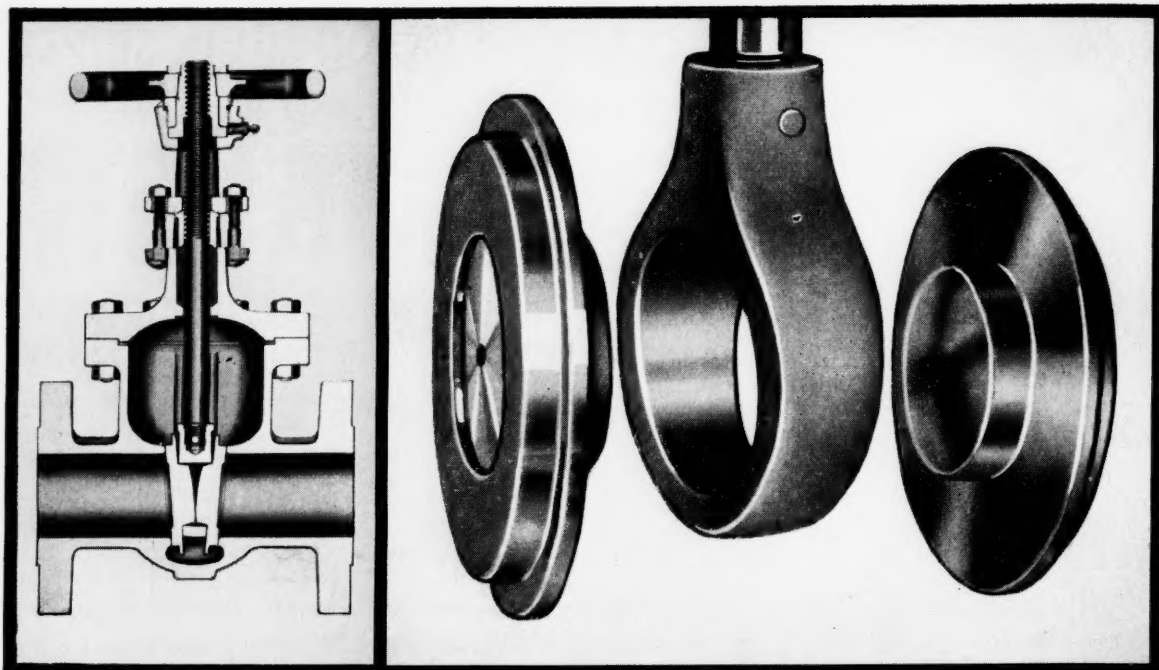


BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

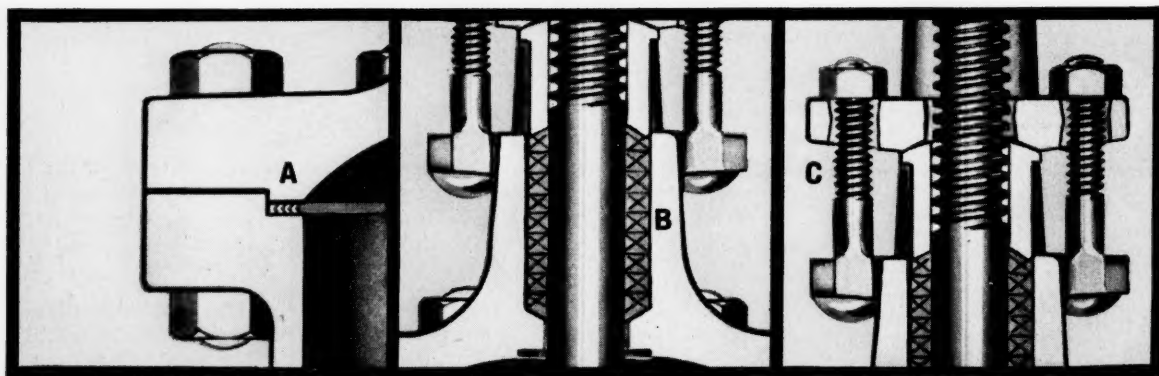
E. I. du Pont de Nemours & Co. (Inc.)
 Fabrics Industrial Sales (1-9), Wilmington 98, Delaware
 Please send literature on gaskets of "Armalon".



Name _____ Position _____
 Company _____
 Address _____
 City _____ Zone _____ State _____



New 300 & 600-Pounders extend Crane line of stainless steel gate valves. Feature unique, free rotating, split-wedge disc.



The unique Crane split-wedge disc design features two identical disc halves, fitted back to back in a carrier that is fastened to the valve stem. The moment the lower portions of the disc halves contact the seats, the carrier exerts uniform pressure on the beveled sides of both disc trunnions, forcing the disc halves outward against the seats. This results in a perfect seal and long trouble-free valve life. Free rotation of disc halves prevents wear and galling, keeps seat faces clean.

Other quality features include (A) Recessed, spiral wound bonnet gasket which permits face to face abutment of body and bonnet flange. Provides pre-

determined gasket loading. (B) Extra deep stuffing box for tightness and long life. (C) Thru stud-bolts for easy upper valve servicing.

There's a wide choice of Crane Stainless Steel Gate Valves in 18-8 SMO or CRANELOY 20 in 150, 300 and 600 Pound Classes with screwed or flanged ends, temperatures up to 800 F. (300 & 600 Pound) . . . up to 500 F. (150 Pound).

For complete details contact your Crane Distributor. Or write to Crane Co., Dept. D, Industrial Products Group, 4100 South Kedzie Ave., Chicago 32, Illinois. In Canada: Crane Ltd., 1170 Beaver Hall Square, Montreal.

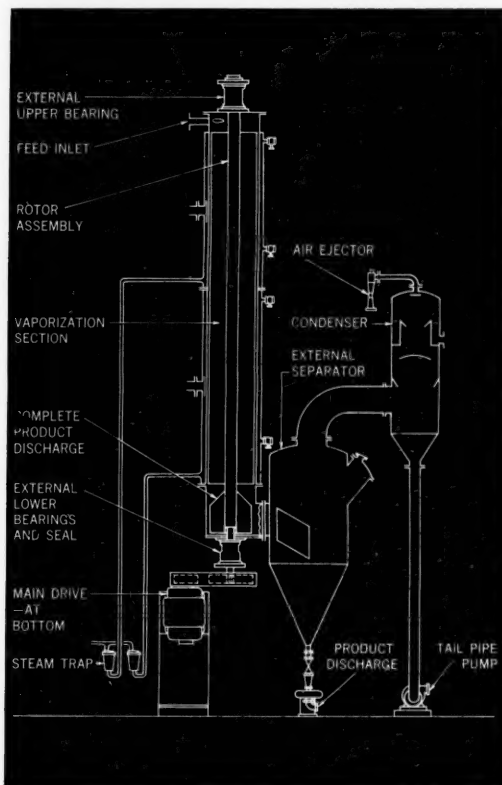
AT THE
HEART
OF HOME AND
INDUSTRY

CRANE

VALVES AND PIPING
ELECTRONIC CONTROLS
PLUMBING
HEATING • AIR CONDITIONING

our customer technical service laboratory solves a problem like this every day in the year

Designers and manufacturers of processing equipment for the chemical and food industries • DRUM DRYERS • VACUUM ROTARY DRYERS • VACUUM SHELF DRYERS • FREEZE DRYERS • AUTOCLAVES FLAKERS • ESSENCE RECOVERY SYSTEMS • And the industry's most complete line of EVAPORATORS



SCHEMATIC VIEW OF ROTO-VAK CONCENTRATOR—Agitated-Film Roto-Vak provides high heat transfer and a processing time of only seconds . . . now permits concentration of viscous, foamy, salting and extremely heat-sensitive products never before successfully concentrated. It can be used to react • heat • concentrate • dehydrate • deodorize • vaporize • evaporate • strip • deaerate.

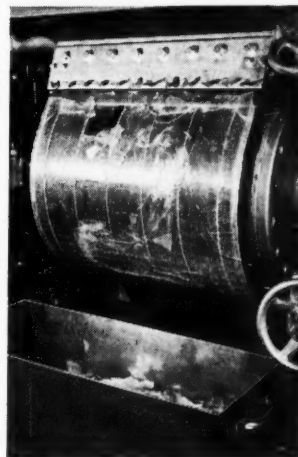
THE SPECIFIED FLAKED PRODUCT LEAVING THE DRUM SURFACE—The material is applied evenly by an applicator roll to the revolving, grooved, cooled drum surface where it solidifies quickly and completely and is removed by a stationary knife after less than one revolution.

Concentrating and flaking a solution. Drying a heat-sensitive, color-sensitive chemical solution to a friable flake can be a problem. One of our customers had it—and then it became ours. Our Customer Technical Service Laboratory found the answer, as it does some 360 times a year.

THE PROBLEM: To produce a 97% to 98% solids, hard, glassy, friable, stable flake from a chemical solution containing 78% solids and having a viscosity of 5,000 centipoises at 125°F.

THE SOLUTION: Buflovak Research and Engineering Departments teamed up a Roto-Vak concentrator and Buflovak Flaker to solve the problem. The Roto-Vak concentrates the solution quickly and at medium temperatures. There is no discoloration. The Flaker, operating at a feed temperature of 260°, uses a grooved, water cooled drum and applicator roll to provide flakes of the required appearance, quality and stability.

Similar problems are solved daily. We would like to help with yours. Call or write for Catalog 392, or see it in the Chemical Engineering Catalog. Buflovak Equipment Division, 1551 Fillmore Avenue, Buffalo 11, New York.



Buflovak Equipment Division
BLAW-KNOX



Blaw-Knox designs and manufactures for America's growth industries: METALS: Rolling Mills • Steel Processing Lines • Rolls • Castings • Open Hearth Specialties • PROCESSING: Process Design, Engineering and Plant Construction Services • Process Equipment and Pressure Piping • CONSTRUCTION: Concrete and Bituminous Paving Machines • Concrete Batching Plants and Forms • Gratings • AEROSPACE: Fixed and Steerable Antennas • Radio Telescopes • Towers and Special Structures • POWER: Power Plant Specialties and Valves

FILTER FABRIC QUIZ

How would you solve these filter fabric problems?

PROBLEM:

You're a soap manufacturer. You wish to filter foreign matter from oil and glycerin. What filter fabric would you use?

SOLUTION:

Closely woven cotton duck has withstood six months of this arduous service. For even longer life, nylon fabrics are recommended.

PROBLEM:

You're a dyestuffs manufacturer. You wish to separate a dye intermediate from a sulphuric and hydrochloric acid solution at 45°C. What filter fabric would you use?

SOLUTION:

A spun dynel fabric with high chemical resistance is both dependable and durable for this highly corrosive process.

PROBLEM:

You're a ceramics manufacturer. You wish to filter clay slurries. And the filter fabric must have good release characteristics and resist mildew and bacteria growth. What filter fabric would you use?

SOLUTION:

A tough fabric of filament nylon is sleek enough that the filter cake drops away at the touch of a scraper—and so durable that fabric life is multiplied many times.

PROBLEM:

You're a pigment processor. You wish to filter titanium dioxide from strong acid solutions with vacuum-type filters. What filter fabric would you use?

SOLUTION:

A fabric of filament Dacron*, highly resistant to mineral acids, provides smooth cake discharge and long service for maximum operating economy.

Each of these solutions is but one of many ways to solve these problems. For, as you know, countless factors help determine a filter fabric's performance—fiber, yarn, weave, count and finish, to name just a few. Selecting the most effective and economical filter fabric for a particular job is a very complex matter. And you need the assistance of

a specialist—like the specialists who distribute Wellington Sears fabrics. These distributors are experts in the field of industrial fabrics—and always ready to lend a hand in helping solve your problems. For their names, and a free copy of our illustrated booklet, "Filter Fabric Facts," write Dept. L-9 today.

*DuPont trademark for its polyester fiber

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TEAMWORK Completes New Cumene Plant in Record Time

When Texaco awarded the contract to M. W. Kellogg for its 70 million pounds/year cumene plant at Westville, N. J., commitments to a phenol manufacturer demanded that the facilities be producing cumene of exceptionally high purity within nine months.

Kellogg, working closely with Texaco's personnel, executed this project—complete and ready for start-up, with a guarantee of product quality and yield—in time to meet the unusually short schedule.

This rapidly executed assignment—one of the fastest of its type on record—is indicative of the speed and efficiency with which Kellogg works to meet clients' special needs.

In Texaco's case, the plant was designed to produce cumene by catalytic alkylation of benzene with propylene. Propylene is supplied by refinery off-gas from Texaco's adjacent Eagle Point refinery. Various

by-products from the plant are returned to the refinery for further processing.

Kellogg was responsible for engineering, procurement, and construction of the cumene plant. Kellogg also coordinated traffic in relocating certain existing equipment from Lockport, Illinois. This equipment was modified and utilized in the Westville plant to save time and minimize capital expenditure.

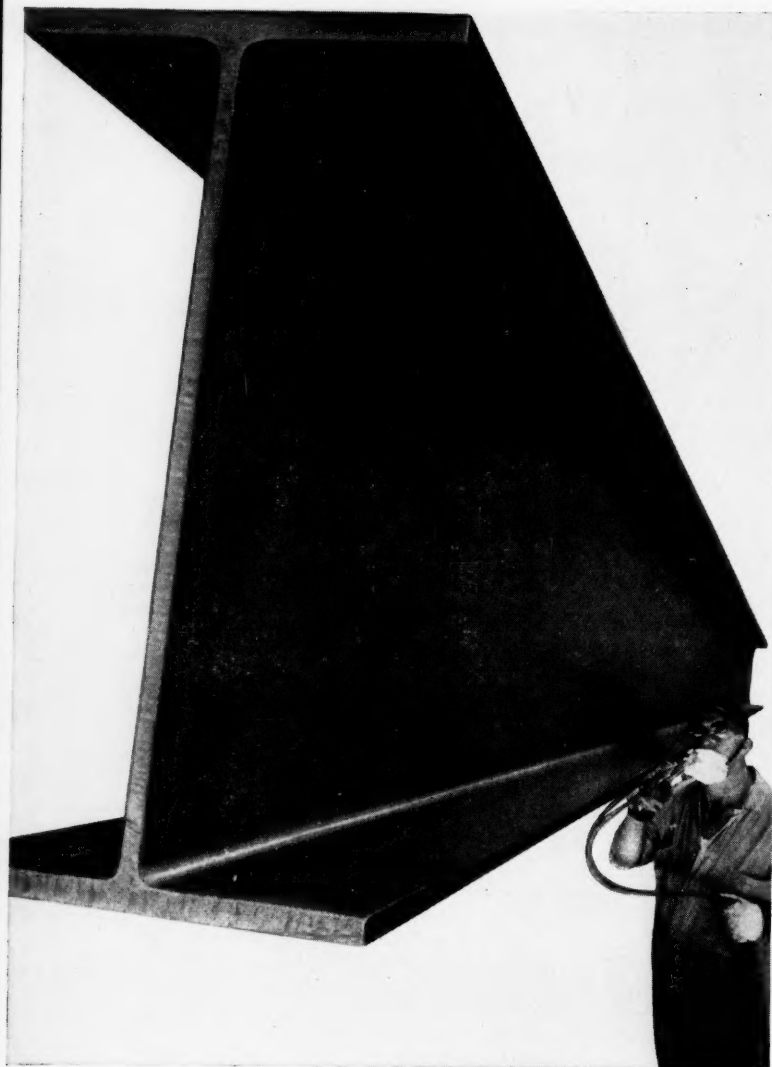
Kellogg welcomes the opportunity to discuss with you how it can execute your new plant in keeping with your own rigorous time and investment requirements.

THE M. W. KELLOGG COMPANY

711 Third Ave., New York 17. A subsidiary of Pullman Incorporated

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Kellogg International Corporation, London
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All the advantages of hot-dip galvanizing PLUS job-site application with CARBO ZINC 11



INORGANIC ZINC COATING is rapidly gaining recognition as the ultimate for basic protection of steel. For example, a large Gulf area chemical plant now under construction specified zinc—both hot-dip galvanizing and Carbo Zinc 11 inorganic zinc coating. Both methods are equal in performance and galvanic protection—the choice is a matter of economics.

HOT-DIP GALVANIZING is generally best for small pieces and irregular shapes: handrails, angles, floor gratings, ladders, etc.

CARBO ZINC 11 is best where these exclusive advantages count:

- Application can be made on the job-site.
- Old steel, in place, can be galvanically protected.
- Repairs can be made in the field.
- Field welding can be touched up.
- Only one side need be coated, such as storage tanks.
- All sizes and shapes can be coated.

EASY TO APPLY with spray or brush in any kind of weather. Water insoluble in 20 minutes. WRITE for analysis of costs "When to Hot-Dip Galvanize—and When to Use Carbo Zinc 11."

Maintenance Coatings with Experience...



32-D Hanley Industrial Ct. • St. Louis 17, Mo.

CPI NEWS BRIEFS . . .

Continued from page 82

500 tons of heavy water produced at Savannah River have been sold since 1955.

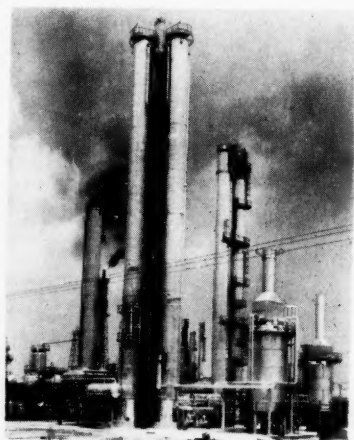
Armour & Co. has awarded Louis DeMarkus Corp., Buffalo, N. Y., a construction contract for both the nitrogen and hydrogen units at its upcoming Kankakee, Ill., edible-oil facility. Rated capacities of the two units will be 250,000 std. cu. ft./day of hydrogen, 4,000 std. cu. ft./day of nitrogen. The former will be consumed by Armour's 150-million-lb./yr. edible-oil refinery, now under construction; nitrogen will be used for blanketing, purging, packaging.

Pacific Engineering & Production Co. of Nevada is building a multi-million-dollar expansion of its ammonium perchlorate plant in Henderson, Nev. New capacity will be about 17 tons/day, up from 7½ tons/day. Due on stream early next year, revamped facility will also turn out some sodium chlorate (a raw material for the ammonium perchlorate), which Pacific now buys; and the firm anticipates marketing some chlorate instead of perchlorate.

Dow Badische Chemical Co. has begun butanol production at its newly completed Freeport, Tex., unit. Current products of the \$2-million facility are iso- and *n*-butanol, though caprolactam production is eyed "soon." Route used is a high-pressure oxo synthesis developed by Germany's Badische Anilin- und Soda Fabrik A.G. (Dow Badische is a three-year-old joint subsidiary of Dow Chemical Co. and BASF Overzee N.V., the latter in turn being a subsidiary of BASF.) Feedstocks include propylene, hydrogen and carbon monoxide, all bought from Dow.

Tidewater Oil Co. and Collier Carbon & Chemical Corp., joint owners of the 50-million-lb./yr. naphthalene plant now abuilding in Delaware City, Del., have purchased an ISI 609 computer control package through the plant's prime

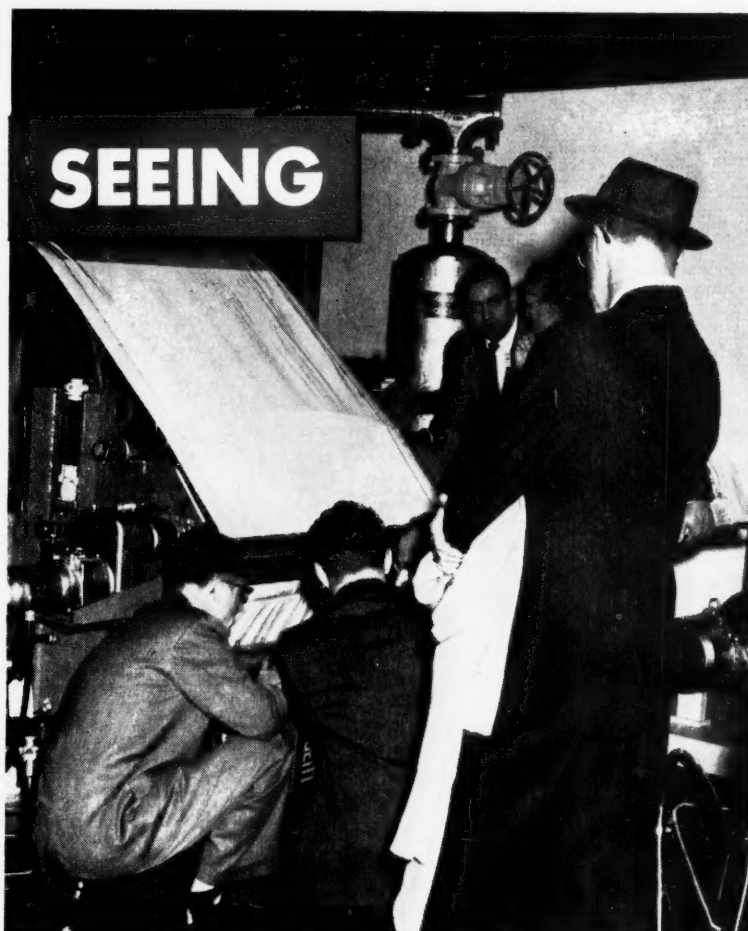
contractor, Catalytic Construction Co. To be supplied this fall by Information Systems, Inc., Los Angeles, the computer will scan 300 temperatures, pressures, flows and fluid levels at the multimillion-dollar facility.



Tenneco Oil Co. has entered the petrochemical field with the completion of two units at its Chalmette, La., refinery (*above*); a 2,200-bbl./day Udex aromatics extraction plant and a 20-million-lb./yr. ethyl benzene installation. Badger Mfg. Co. constructed both. The ethyl benzene facility uses part of the styrene-from-gasoline route that Badger developed jointly with Cosden Petroleum Corp., in which mixed xylenes from the Udex unit are processed into polystyrene-grade ethyl benzene.

Cary Chemicals, Inc., has taken an option on 66 acres fronting the Delaware River in Burlington Township, near Burlington, N. J., for its upcoming polyvinyl chloride plant (*Chem. Eng.*, Aug. 21, p. 78). Due on stream by the fall of 1962, facility will turn out 100 million lb./yr. of PVC and vinyl copolymers from vinyl acetate and chloride monomers, to be shipped from Houston by Tenneco Chemical Co. under its recently arranged "financing, marketing and production association" with Cary.

AviSun Corp.'s 100-million-lb./yr. polypropylene plant at New Castle, Del., will officially be opened Sept.



is the best answer

There is no quicker and better way to learn of new developments — to compare their relative merits—to get new ideas that may cut costs and improve your products — than to actually **SEE** what's new at the Exposition of Chemical Industries.

Your limited time will be well spent in studying the fact-filled displays of over 500 leading manufacturers of process equipment, materials handling, chemicals and raw materials, laboratory equipment and supplies, control instruments and automation.

Keep informed—plan your visit now, and bring your associates with you. It will more than pay you for the modest investment in time. Write for free advance registration.

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28th EXPOSITION OF CHEMICAL INDUSTRIES

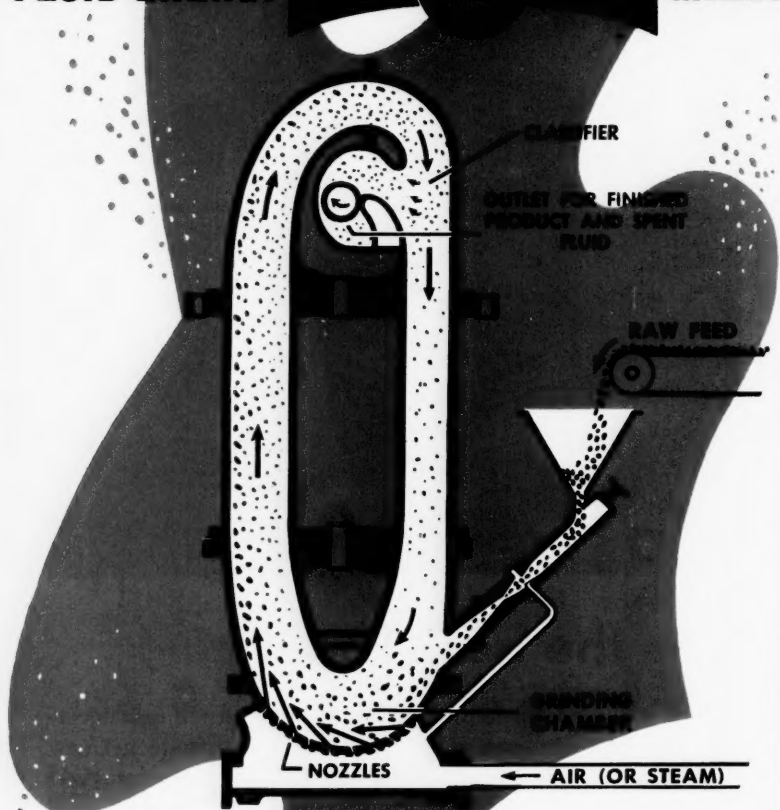
N. Y. Coliseum, Nov. 27—Dec. 1, 1961

Exposition of Chemical Industries, Inc., 400 Lexington Ave., N. Y. 17, N. Y.

for

GRINDING AND DEHYDRATION FINER PARTICLES LOW MAINTENANCE

FLUID ENERGY JET-O-MIZER MILLS



The Fluid Energy "Jet-O-Mizer" Mill, designed and built by the pioneers in fluid energy fine grinding, does far more than produce fine particles. It controls fineness and product quality with a narrow distribution range and simultaneously with grinding can dehydrate, coat particles, blend and achieve chemical changes.

Jet-O-Mizer Mills are being used all over the world, processing many types of materials in the following industries:

- Abrasive
- Insecticide
- Ceramic
- Food
- Mineral
- Pharmaceutical
- Pigment
- Plastic
- Carbon
- Wax
- Metal
- Chemical

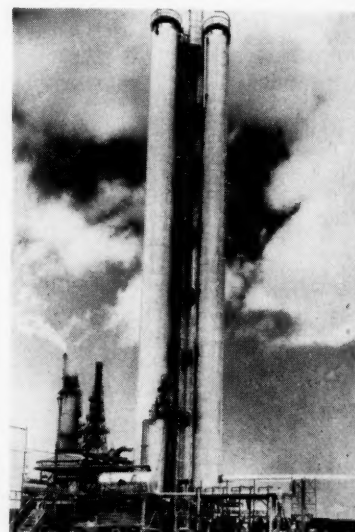
"Jet-O-Mizing" produces **FINE PARTICLES** 1/4 micron average and above **PLUS . . .** Narrow Particle Distribution • Dry, or Controlled Moisture Content • Continuous Operation • Uniformity of End Product • Other Operations with Grinding • No Attritional Heat — No Moving Parts • Low Operating Costs • Low Maintenance

Send for complete information on Fluid Energy's "Jet-O-Mizer" Mills, "Jet-O-Clone" Dust Collectors, and TESTING AND CUSTOM GRINDING services.

FLUID ENERGY PROCESSING & EQUIPMENT COMPANY
Richmond & Norris Streets, Philadelphia 25, Pa. • Phone: Regent 9-7728
(Formerly known as the Wheeler-Stephanoff Mill)

CPI NEWS BRIEFS . . .

21. Initial testing of equipment at the multimillion-dollar facility is now under way (full story: *Chem. Eng.*, Aug. 7, p. 76).



Suntime Refining Co.'s 30-million-lb./yr. ethyl benzene plant (above) is on stream at Corpus Christi, Tex. Designed, engineered, and constructed in seven months by Badger Mfg. Co., the unit uses the single-step route developed jointly by Badger and Cosden Petroleum Corp. It recovers 330 bbl./day of high-purity ethyl benzene from 1,500 bbl. of a mixed-xylenes Udex effluent. A wholly owned subsidiary of Sunray Mid-Continent Oil Co., Suntime has already begun construction of its seventh and eighth petrochemical facilities—a styrene unit and a *p*-xylene plant.

Brunswick Pulp & Paper Co. has awarded Stone & Webster Engineering Corp. the principal construction contract for a \$35-million expansion of its pulp-and-paper mill at Brunswick, Ga. Due on stream in January 1963, enlarged facilities will have capacity for 1,120 tons/day of bleached kraft pulp, 400 tons/day of bleached Fourdrinier paperboard.

American Cyanamid Co. will build a multimillion-dollar plant in Wallingford, Conn., to produce methyl methacrylate molding powder. Due on stream next summer, facility

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What this country needs is a good 10¢ oxidizer!

We have one: Allied Chemical Nitrogen Tetroxide. N_2O_4 carries about 70% oxygen—half available under mild conditions, the total amount under more vigorous conditions. You can use it as a selective or partial oxidizing agent in a wide variety of reactions—including vapor phase reactions. And N_2O_4 costs less than an inexpensive cigar: the price ranges from 6½¢/lb. in tankcars to 15¢/lb. in small lots of cylinders.

N_2O_4 gives you these other advantages in oxidation reactions: **1. Not corrosive**—mild steel equipment is suitable for dry

N_2O_4 storage at ordinary temperatures and pressures. **2. Low vapor pressure eliminates special handling** needed with high-pressure oxidizers. **3. High solubility in halogenated organic solvents.** **4. Can be used in many forms**—at very low temperatures in solutions such as NO in N_2O_4 ; as concentrated liquid from -11° to 21° C.; at elevated temperatures as NO_2 gas; in acids such as sulfuric and nitric; as solutions in common solvents—e.g., carbon tetrachloride,

and hydrogen-free chlorofluoromethanes.

Nitrogen Tetroxide from Allied Chemical is available in tankcars, one-ton cylinders and 150-pound or 125-pound cylinders.

For technical information, write for "The Reactions of Nitrogen Tetroxide With Organic Compounds." For specs and local offices, see Chem. Materials Catalog, Page 272 A; Chem. Week Buyers Guide, page 27.

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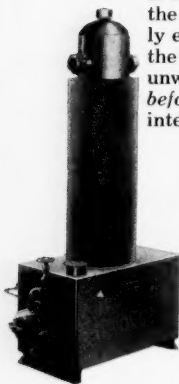
NITROGEN DIVISION
Dept. NT 16-5-1, 40 Rector St., N. Y. 6, N. Y.

Why REFRIGERATE to remove oil and water from compressed air?



RESULTS!.. It's as simple as that!

Leading authorities have proved that the most economical method of removing physical contaminants from compressed air is to lower the temperature of the air by refrigeration. Refrigeration effectively establishes a practical "dew-point." This practical dew-point is the means of collecting and effecting maximum precipitation of unwanted contaminants at a point in the compressed air system before damage to vital instruments and controls results. Sound interesting? Then take a closer look at the



AIR-ENGINEERED REFRIGIFILTER

... a refrigerated "packaged" unit consisting of filter, separator, condenser, heat exchanger and automatic trap—ready to install, no extras! A closed-loop refrigeration cycle (to obtain -10° F. to -30° F. dew-points) is employed to precipitate vapors and separate entrained moisture and oil, dirt and sludge before these contaminants can raise havoc by plugging orifices, rusting and corroding vital parts of the instrumentation and pneumatic system. Complete data including installation drawings and specifications is available.

Send for Bulletin 902 today!

Hankison

CORPORATION

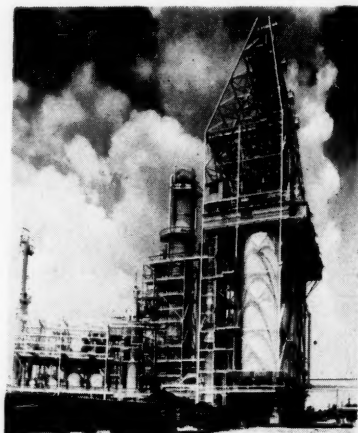
College at Pike Canonsburg, Pa.
(Pittsburgh Area)



PREFERRED FOR PRACTICAL AIR DRYING

CPI NEWS BRIEFS . . .

will use an Imperial Chemical Industries, Ltd., route to the hued or clear thermoplastic, which can be made opaque, translucent or transparent. Plant's capacity is undisclosed.



Mobil Oil Co. has announced completion of a 20,000-bbl./day delayed coking unit (*above*) at its Beaumont, Tex., refinery. Unit produces up to 800 tons/day of coke, also converts heavy fuels and residues into gasolines, light fuel oils, and petroleum gases. (Mobil now has a total coke capacity of 3,300 tons/day, probably the largest in the country.) Long-term contracts for sale of the unit's coke have already been signed.

Air Reduction Co. has released details of the recently announced plan (*Chem. Eng.*, Sept. 4, p. 76) to build a 22-mi. nitrogen pipeline under the Delaware River. A T-shaped circuit, it will be the longest N_2 line in the US, pumping 100 tons/day of high-purity nitrogen from Claymount, Del., to Shell Chemical's polypropylene plant in Woodbury, N. J., and Du Pont's Chambers Works at Deepwater Point, N. J. The line is one of eight being laid by Airco's next-door neighbor, SunOlin Chemical Co.; Airco will lease both this and another, far shorter, one (latter will carry oxygen under the river).

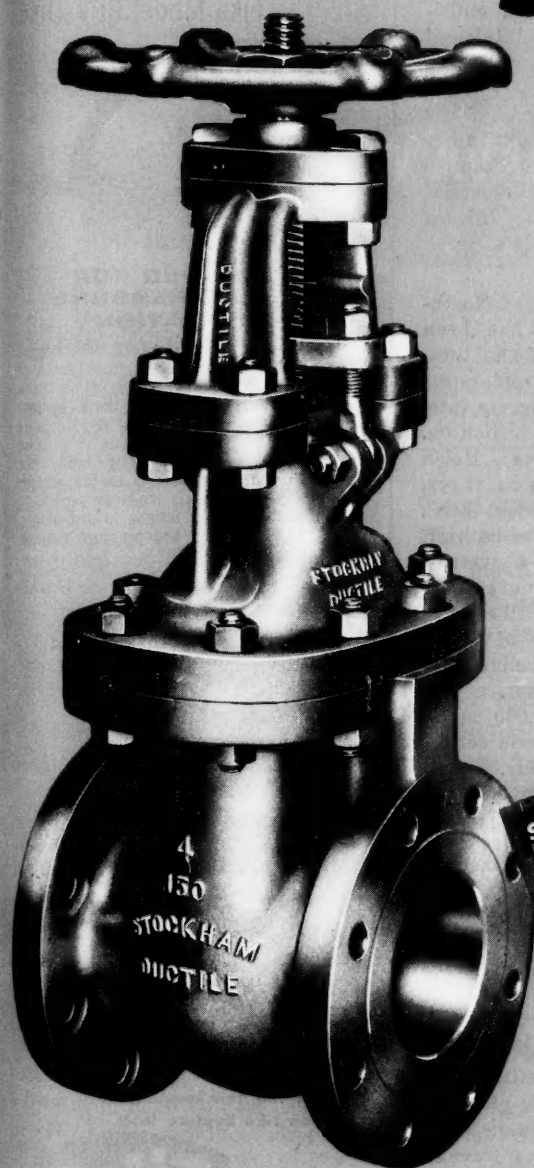
Airco's \$6.5-million air-separation plant at Claymount, now being built and subsequently to be

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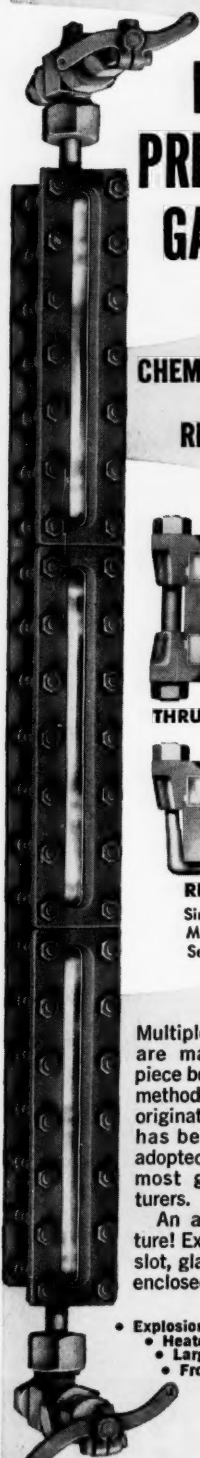
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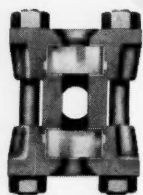
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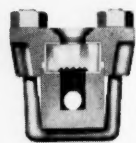


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CPI NEWS BRIEFS . . .

operated by its Air Reduction Sales Co. division, was originally slated to make 350 tons/day of oxygen and 25 tons/day of nitrogen (*Chem. Eng.*, Apr. 3, p. 108)—but Airco now boasts "ultimate" capacities of 750 tons/day of oxygen and nitrogen, 12 tons/day of argon.

Texaco Inc. has opened a multi-million-dollar, automated lube-oil blending plant at River Rouge, Mich. Control console enables a technician to mix a total of six additives and base stocks automatically, creating more than 40 types of consumer and industrial lubricating grades for the Midwest market.

Helix Co., a subsidiary of Northern Natural Gas Co., has been awarded U. S. Dept. of the Interior's first contract under its helium-conservation program (aim is ultimately to save 52 billion cu. ft. of the now-wasted gas). Helix will produce 700 million cu. ft./yr. of raw helium at Bushton, Kan., in an extraction plant to be built by The Fluor Corp. Extraction equipment will be manufactured by Air Products and Chemicals Inc. Interior's Bureau of Mines will buy and store all helium produced in the Helix plant, paying at the rate of \$11.24/1,000 cu. ft. (with an annual purchase ceiling of \$9.5 million stipulated). Plant's output gas will contain 60% helium, 40% nitrogen. As the market demands, stockpiled raw helium will from time to time be purified by BuMines for government or private purchasers. Contract extends for 22 years, calls for first delivery by January 1 of next year.

Baird Chemical Industries, New York, plans a \$1.5-million, 20-million-lb./yr. sorbitol plant in Peoria, Ill., along the Illinois River section of the inland waterway. Badger Mfg. Co. will design and construct.

Crown Central Petroleum Corp. has placed a 17-million-gal./yr.



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The Fike CPV unit is more rugged than conventional rupture discs of low rupture pressure. It is more easily handled and there is less danger of damaging the rupture disc during installation. The close fitting holddown ring holds the rupture disc snugly to the vacuum support. This reduces wrinkling and possible fatigue failure in cycling vacuum and pressure service. Sizes 1" to 30".

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Send for the new complete catalog on Fike Rupture Discs.

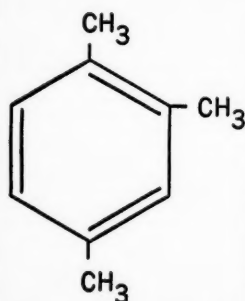


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Pseudocumene (wt per cent).....	95.0
Distillation °F	
Initial.....	335
50 per cent.....	337
Dry Point.....	340
Color.....	Water White
Doctor Test.....	Pass
Flash (Tag Closed Cup) °F.....	119
Specific Gravity (60/60°F).....	0.878

FIRST from Enjay in commercial quantities... pseudocumene (1,2,4-trimethylbenzene) is now available for immediate delivery. Enjay pseudocumene is a low-cost, highly reactive, aromatic hydrocarbon which can be readily converted to intermediates for production of surface coatings, plasticizers, drugs, dyes and many other products.

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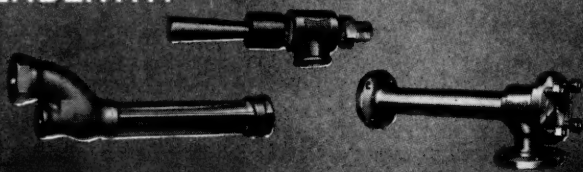
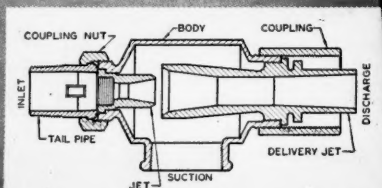


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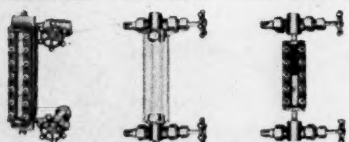
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CPI NEWS BRIEFS . . .

Detol benzene unit on stream at its refinery near Houston. Licensed from Houdry Process Corp., the Detol hydrodealkylation route produces benzene from toluene at Crown Central's plant, but can also make benzene from xylenes, from mixtures of toluene and xylenes, or from alkyl benzene concentrates. Catalytic Construction Co. constructed the plant within five months of the date its engineering work was initiated.

Companies

Air Products and Chemicals Inc. is the new name of Air Products, Inc., Allentown, Pa. The intricate legal move involved (1) transfer of incorporation state to Delaware from Michigan, (2) merger of Air Products, Inc., into its former wholly owned subsidiary, Air Products and Chemicals, Inc., (3) acquisition of Southern Oxygen Co., Bladensburg, Md.

American-Marietta Co. and The Martin Co. stockholders will vote Oct. 9 on the proposed consolidation into a new enterprise, Martin-Marietta Corp. (*Chem. Eng.*, Aug. 7, p. 165). American-Marietta's shareholders vote in Chicago; Martin's, in Middle River, Md.

Atlantic Research Corp., Alexandria, Va., and Flight Sciences Laboratory, Inc., Buffalo, N. Y., have merged. A young (1958) aero- and astronautics research and engineering firm, Flight Sciences is now operated as an "independent activity" of the Atlantic Research Corp. group.

Gulf States Land & Industries, Inc., has "agreed to acquire" Chemetals Corp., a closely held research organization that recently developed a process (jointly with Sherritt Gordon Mines, Ltd.) for extracting copper from scrap and low-grade ores. Announcement came from Webb & Knapp, Inc., of which Gulf States is a subsidiary, after overcoming the SEC's initial objections to a too-early release of

the news. Terms stipulate the exchange of 460,000 authorized but unissued common shares of Gulf States for all outstanding shares of Chemetals.

Chas. Pfizer & Co., Inc., the Brooklyn, N. Y., pharmaceuticals firm, has signed a contract to exchange approximately 300,000 shares of its common stock for the business and assets of New England Lime Co., Adams, Mass. The deal includes a subsidiary of the limestone-mining company, Nelco Metals, Inc., which produces high-purity metallic calcium and magnesium, as well as limestone products, in Canaan, Conn.

Evans Products Co.'s stockholders have approved the stock-exchange acquisition of Aberdeen Plywood and Veneers, Inc., Aberdeen, Wash. Evans' 1960 sales were over \$79 million; Aberdeen's, \$29 million. Acquisition is said to make Evans the third largest integrated plywood producer in the country.

Eberly Dynamics Inc. has purchased Protective Plastic Co., a Bedford, Ohio, manufacturer of hoods, tanks and glass-fiber-reinforced plastic ducts and stacks.

International

Canada: British American Oil Co., Ltd., has placed on stream the gigantic (billed as Canada's largest), \$12.5-million gas processing plant at Rimbey, Alta., 90 miles southwest of Edmonton (*Chem. Eng.*, Mar. 21, 1960, p. 192). Operated by BA for 27 owners, the units will process up to 200 million std. cu. ft./day of raw gas from the Westrose South field, up to 126 million std. cu. ft./day from the Homeglen-Rimbey field.

Dominican Republic has retained Meissner Engineers, Inc., Chicago, to "develop exploitation" of what is believed to be the largest deposit of high-grade iron ore in the Western Hemisphere. A UN technical advisor has called the iron ore de-

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CPI NEWS BRIEFS . . .

posits in Sanchez Ramirez and Duarte provinces "extraordinarily large." Tentatively proposed is a \$60-million mining and processing facility that will initially turn out 5 million tons/yr. of ore but can readily be expanded to twice that production rate. Dominican government would retain 51% ownership in whatever legal structure would finally be set up.

Israel is constructing a \$75-million port at Ashdod, to be completed by 1970. Initial phase has been dubbed "the citrus stage," after the nation's largest crop and major export item. To cost \$40 million, it will provide cargo capacity for 900,000 tons/yr. of citrus, potash and other extracted chemicals from the Dead Sea and the Negev. Second-stage extension of harbor and docking facilities will cost an additional \$35 million, bring the port's capacity to 3 million tons/yr. (Israel's principal Mediterranean port, Haifa, is expected shortly to reach its 2.68-million-ton cargo capacity, and is now being expanded. The nation's 50,000-ton Red Sea port, Elath, is also undergoing an expansion program.)

Poland's state-held trade organization, Polimex, has signed a \$5.6-million contract in Warsaw with Constructors John Brown Ltd. to design, supply and install three tonnage oxygen and nitrogen plants for ammonia production at Tarnow in southern Poland. To come on stream one by one over the next five years, the units will have combined capacity for nearly 1,000 long tons/day of oxygen, 1,000 long tons/day of nitrogen—enough to produce 1,000 long tons/day of ammonia end-product.

In a separate development, Polimex also signed a \$5.6-million contract with Courtaulds Ltd., this one for construction of an acrylic fiber plant in Lodz. Unit would be the fourth synthetic fiber installation purchased by Poland since 1956. (On Courtaulds' side, the British firm has taken at least the following Iron Curtain orders in the last three years: (1) in June 1960, a \$5.6-million acrylic fiber plant for

from Yarnall-Waring Company, Philadelphia 18, Pa.

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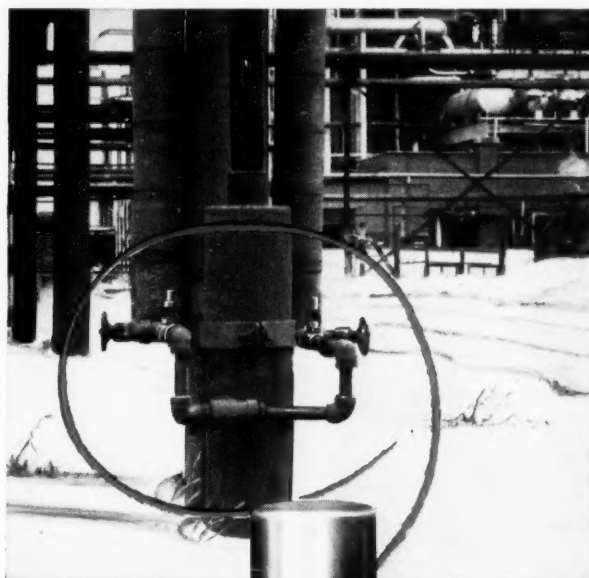
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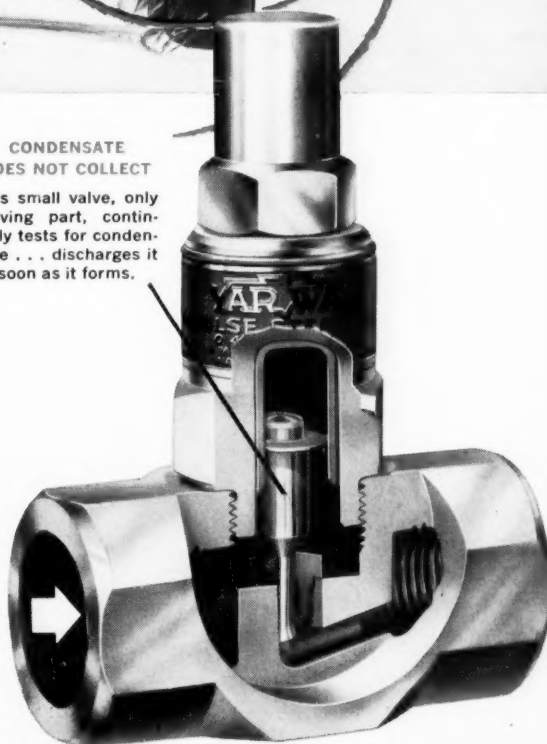
LIGHT TO MODERATE
CONDENSATE
LOADS



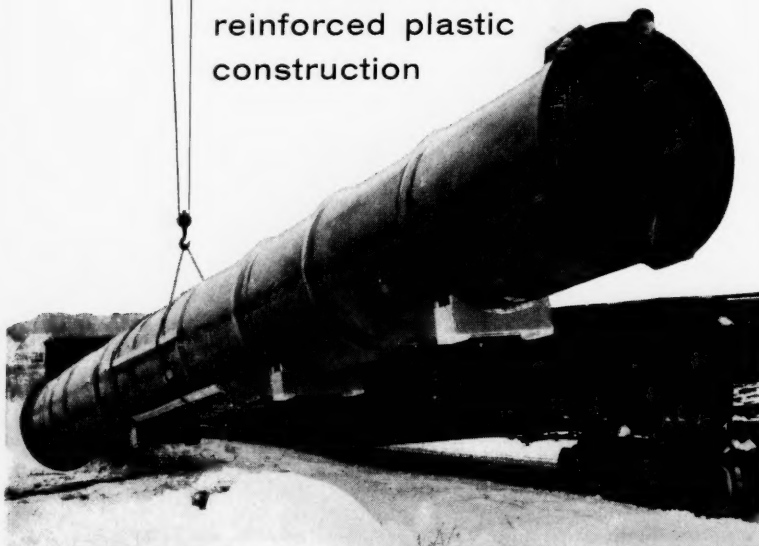
Series 30



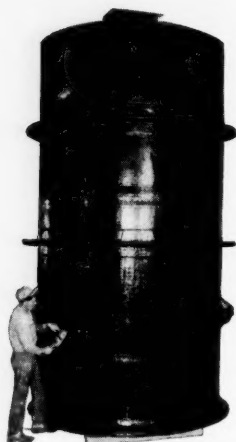
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PLANTS IN ARCADE, NEW YORK ATLANTIC BEACH, FLORIDA

CPI NEWS BRIEFS . . .

Yugoslavia; (2) in 1958, an \$11.2-million acetate yarn installation for the Soviet Union; (3) in 1959, a \$42-million unit to make viscose tire cord, acrylic fiber and acetate yarn in the Soviet Union.)

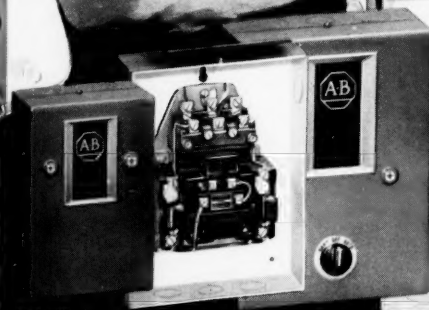
West Germany: Deutsche Shell A.G. plans to start construction of its Ingolstadt refinery (*Chem. Eng.*, Aug. 21, p. 161) before the end of this year. Refinery is now scheduled to begin operating Jan. 1, 1964, though Shell emphasizes that completion could be speeded if market conditions warrant. Initial crude-oil throughput will be 2 million tons/yr.; total construction cost is pegged at \$37-50 million. Refinery occupies only 245 of the site's 345 acres, so the addition of petrochemical units is probable.

Brazil: Carbocloro - Industrias Quimicas Ltda. has begun constructing its electrolytic caustic/chlorine plant at Cubatao (*Chem. Eng.*, June 26, p. 168). Believed to be South America's largest, the unit has design capacity for 90 tons/day of chlorine and 100 tons/day of caustic soda, both readily expandable to double those amounts. Hydrochloric acid and dicalcium phosphate will be produced initially. Scheduled to begin operating in 1963, unit calls for first-stage investment of \$15 million by Carbocloro's four parents: the U.S.'s Diamond Alkali International Corp., Brazil's Quimica Industrial Medicinalis S.A. and Brazil Warrant Cia. de Comercio e Participacoes, and Italy's Ibis International Industrial Investments, Inc.

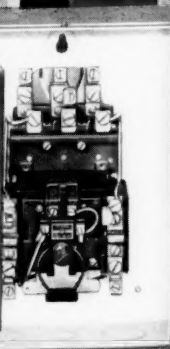
Great Britain: Fisons Ltd.'s \$22.4-million expansion of nitrogen capacity at Flixborough, Lincolnshire (*Chem. Eng.*, June 12, p. 286), is now scheduled for completion late this year. Full-scale operation at doubled capacity (26,000 long tons/yr.) is eyed for early 1962.

Argentina's Economics Ministry has been offered 15-year financing terms in a bid by ENI, Italy's oil-and-gas monopoly, to build and operate a 1,066-mi. gas pipeline for Argentina's state gas agency. Line would stretch from Canadon Seco,

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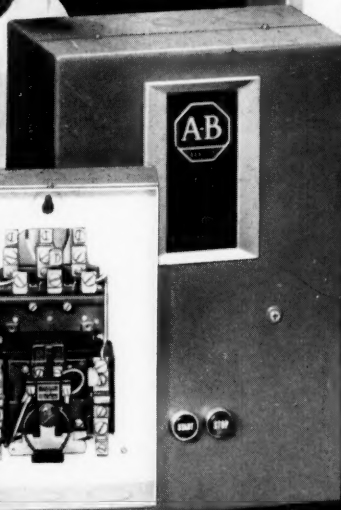


SIZE 00
1½ HP, 220 V
2 HP, 440-550 V

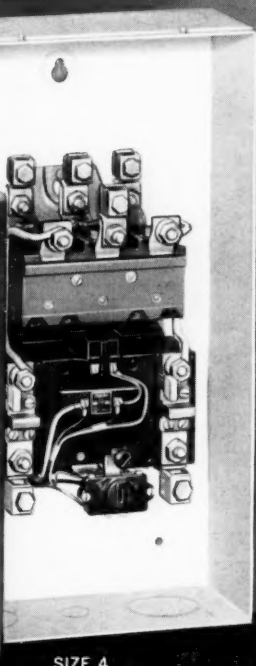


SIZE 0
3 HP, 220 V
5 HP, 440-550 V

SIZE 1
7½ HP, 220 V
10 HP, 440-550 V



SIZE 2
15 HP, 220 V
25 HP, 440-550 V



SIZE 3
30 HP, 220 V
50 HP, 440-550 V

SIZE 4
50 HP, 220 V
100 HP, 440-550 V

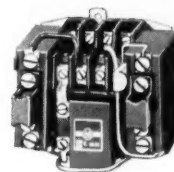
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100 HP, 220 V
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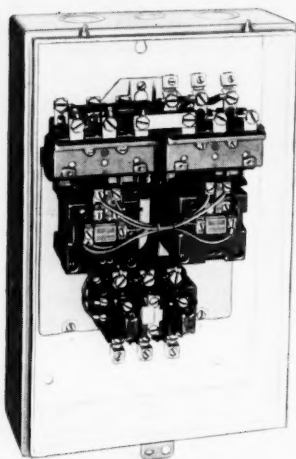
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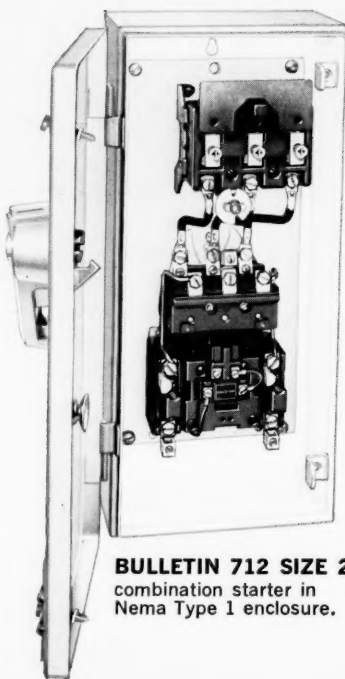
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| 4. Longer life | 9. Surprising light weight |
| 5. Conscientious overload protection | |

The heart of this new line of magnetic motor starters is the unique solenoid contactor. While it retains the famous A-B one-moving-part principle, it is completely new and far more efficient. This fact is reflected in reduced dimensions for all of these controls. Yet, this contactor design will perform reliably for many more *millions* of trouble free operations.

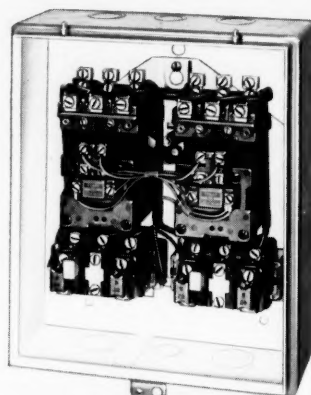
The new enclosures are very "eye appealing." When the open type starters are assembled into special panels, their neatness and compactness will delight the designers. Full details are in Publication 6100. Please write: Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.



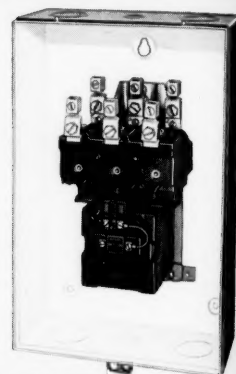
BULLETIN 705 SIZE 2
across-the-line reversing starter
and overload relays in Nema
Type 1 enclosure.



BULLETIN 712 SIZE 2
combination starter in
Nema Type 1 enclosure.



BULLETIN 715 SIZE 1
across-the-line, two-speed
starter—with two overload re-
lays per speed—in Nema Type
1 enclosure.



BULLETIN 702 SIZE 3
three-pole, a-c solenoid contactor
in Nema Type 1 enclosure.



BULLETIN 709 SIZE 3
across-the-line solenoid starter
in Nema Type 1 enclosure.

ALLEN-BRADLEY

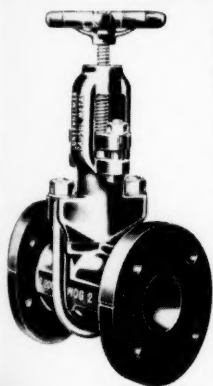
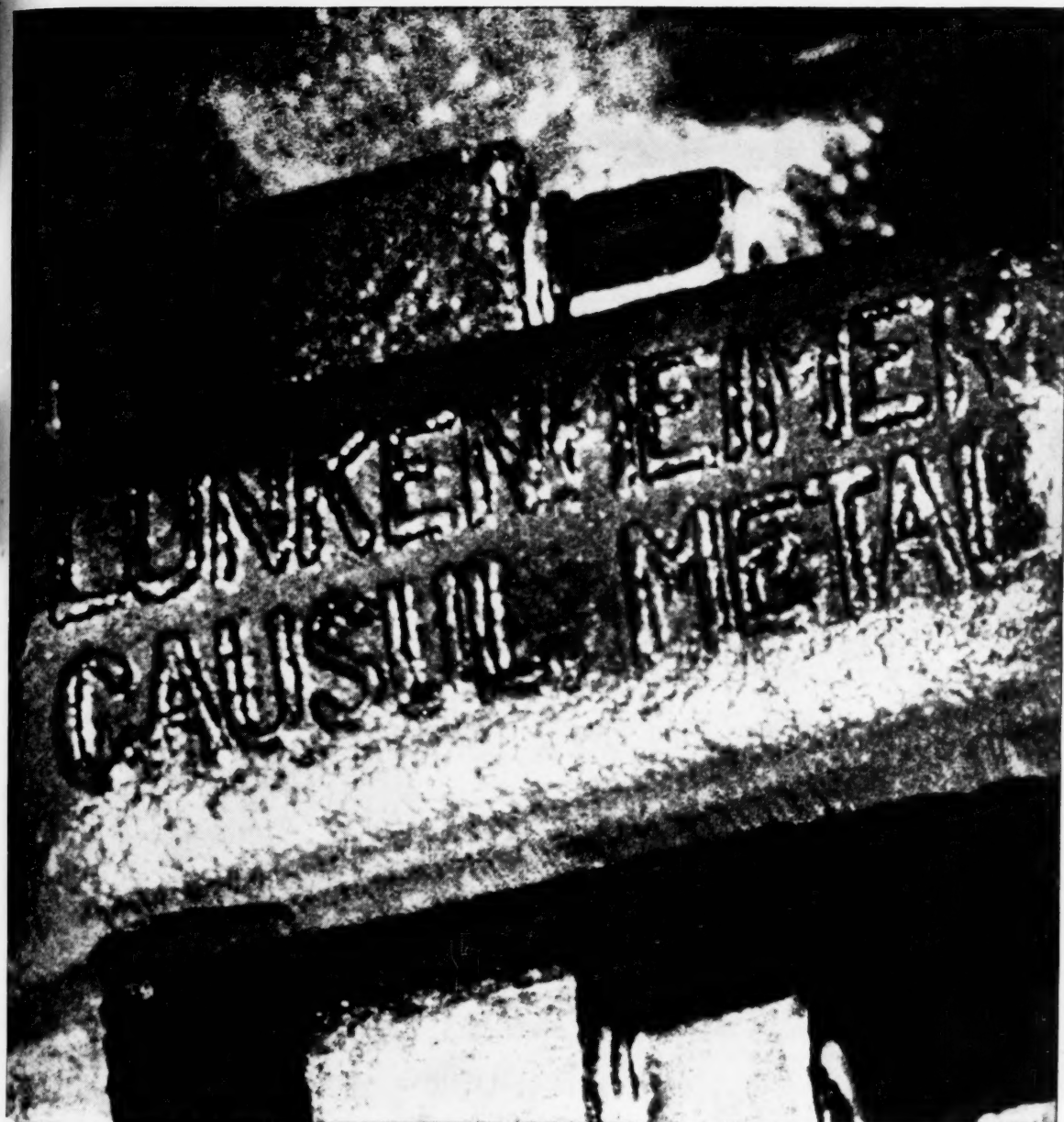
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QUALITY
MOTOR CONTROL

15-61-HR

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CHEM



How to break the "High-Priced Valve" Habit in corrosive services

... Corrosive service once called for premium-priced valves—made entirely of stainless steel or Monel Metal. Then Lunkenheimer developed exclusive "Causul" Metal to provide "high-alloy" performance at *lower cost* . . . *balanced corrosion resistance* for many caustic, acid and alkaline solutions. The result has been a substantial reduction in valve costs in countless applications that formerly required premium-priced alloys. Ask your Lunkenheimer Distributor to review the corrosive problems in *your* plant. Or write the Lunkenheimer Company, Cincinnati 14, Ohio. **You can't find the cost of a valve on a price list.**

- BRONZE
- IRON
- STEEL
- PVC



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THE ONE *Great* NAME IN VALVES

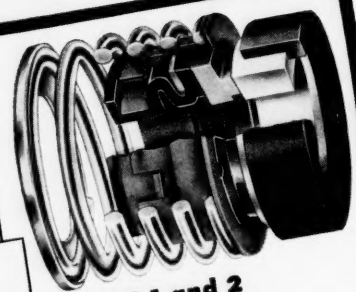
L-280-13

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TYPE 9
SULPHURIC ACID
BLACK LIQUORS
SODIUM SULPHIDE
CHLORINE
SULPHITE PULP



TYPES 1 and 2
ALUM SOLUTION
ANHYDROUS AMMONIA
FORMALDEHYDE
LATEX
SODIUM SILICATE

MECHANICAL SEALS

There is no better way to cut liquid handling costs than with "John Crane" Seals. They are specially engineered for the Paper Industry to provide these important operational savings:

- 1 Eliminating loss of expensive and corrosive fluids.
- 2 Positive sealing of toxics, thus minimizing need for costly exhaust equipment.
- 3 Substantially reduced maintenance and the man-hours involved.
- 4 Reduction of "shutdown periods" due to materially increased service-life expectancy over and above your present methods.

Ranging from the Types 1 and 2 (for services where synthetic rubber is suitable) to the Type 9 (with sealing members made of DuPont Teflon to handle any industrial chemical or corrosive) . . . there is a "John Crane" Seal that can be adapted to your individual conditions.

remember: Your toughest problem can be "John Crane's" next success story.

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CRANE PACKING COMPANY

CPI NEWS BRIEFS . . .

in southern Argentina, to Buenos Aires. Including interest on original cash layout, cost of the project's first two stages would be \$210 million; total cost approximates \$300 million by the end of the fifteenth year of construction and operation—not counting operating costs.

Meanwhile, India's Finance Ministry has raised "serious objections" to ENI's \$120-million foreign-exchange credit offer (*Chem. Eng.*, Sept. 4, p. 172). The fate of the pipeline, the refinery and the petrochemical deal is in doubt.

Saudi Arabia: Arabian American Oil Co., Dhahran, has bought a 115,000-gal./day desalinator from Ionics Inc., Cambridge, Mass. Already shipped, the unit will electrically convert brackish well water into a potable supply for the 6,000 residents of the desert community of Dhahran, replacing a still.

India: A new firm, India Carbon Ltd., has been sanctioned by the government to set up a 60,000-ton/yr. plant at Gauhati, Assam state, to make calcined petroleum coke and calcined anthracite coal—both of which are now wholly imported. Due on stream in September 1962, facility is near prime raw-material sources, the Digboi and Nunmati refineries. The U.S.'s Great Lakes Carbon Corp. is "technical collaborator"—i.e., will run the plant, have two members on the company's board, and probably own 40% of the \$1-million stock issue that is soon to be offered on the Indian market.

Netherlands: Shell International Chemical Co. Ltd. is building a \$5.6-million plant at its refinery in Pernis, near Rotterdam, to produce a "new group" of synthetic organic acids. Shell describes the acids as a blend of C₈, C₁₀ and C₁₂ monocarboxylics, says that esters made from them have great stability against hydrolysis. Unit is due on stream in January.

Japan: Eight member firms of the Mitsubishi group have applied to

MITI, the state licensing agency, for approval to create a joint aluminum firm with Reynolds Metals Co. Company would be named Mitsubishi-Reynolds Aluminum Co., Ltd., capitalized at \$6.2 million. Manufacture of aluminum sheets, cans, powder and wires is slated for early 1963. (The Mitsubishi firms involved: Mitsubishi Metals Mining, Mitsubishi Chemicals, Mitsubishi Heavy Industries Reorganized, Mitsubishi Nihon Heavy Industries, Mitsubishi Shipbuilding & Engineering, Mitsubishi Electric Machinery, Mitsubishi Trading, and Mitsubishi Bank.)

India: The state-owned Fertilizer Corp. of India, now constructing a \$50-million fertilizers project on the island of Trombay, near Bombay (*Chem. Eng.*, Apr. 17, p. 218), plans to produce "substantial" but undisclosed tonnages of byproduct argon at the site as well. Already announced for the complex have been urea, nitrogen and sundry fertilizer units.

Cyprus plans to spend \$173.5 million during a five-year (1962-66) development plan, half of the sum to come from internal sources. In his first address to the House of Representatives as President of Cyprus, Archbishop Makarios singled out agriculture as the backbone of the island's economy, said \$68.6 million will go toward the development of agriculture, forestry, and water supplies. About \$30.8 million has been pegged for harbor development, \$29.4 million for electrification. Remainder of the funds is for telecommunications, roads, health and to increase tourism. Cyprus won its independence from the United Kingdom a year ago.

People

Fred G. Gronemeyer, vice president of industrial development, has been promoted to senior vice



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... AND

PUMP IT!!!

A very small amount of Marasperse . . . (in some instances as little as .1%-3% on the weight of the solids in the slurry) will make a thick aqueous slurry thinner — thin enough to pump without adding water.

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Marasperse accomplishes the results you want by dispersing insoluble solids and preventing flocculation of small solids particles.

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It takes only a few minutes to decide if Marasperse dispersants will solve your dispersion and viscosity problems. Simple laboratory screening tests in our literature tell you how. Write for Marasperse samples and technical bulletins.

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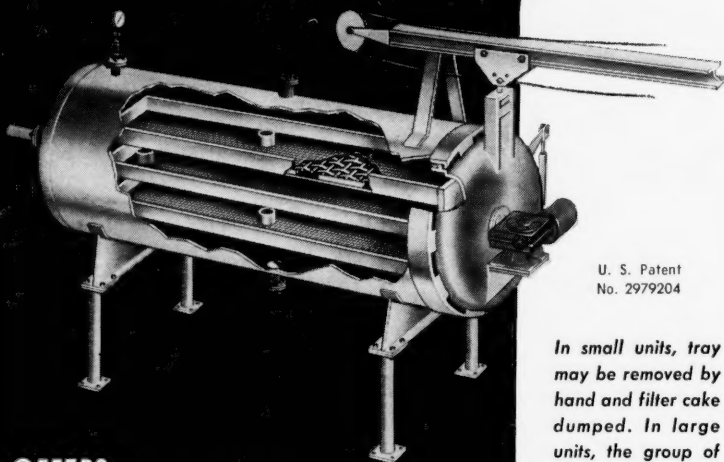
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HORIZONTAL TRAY FILTER



U. S. Patent
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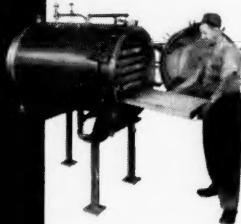
- 1—Total recovery of solids, with no liquid heel.
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- 7—Intermittent filtering without danger of cake falling or moving.
- 8—Steaming, blow down and discharge of solids inside the tank to eliminate dust and dirt hazards.
- 9—Drying of solids in place, under vacuum, if necessary.

Write for Bulletin 152.

T. SHRIVER & COMPANY, Inc.

802 HAMILTON ST., HARRISON, N. J.

In small units, tray may be removed by hand and filter cake dumped. In large units, the group of trays may be rolled out and mechanically rotated to dump cake, or rotated inside tank to drop cake into built-in hopper bottom for reslurrying, or for removal as solids by a scroll conveyor. Size, depth and number of trays depend on nature and amount of material to be processed.



CPI NEWS BRIEFS . . .

president and executive director of industrial development for The Chemstrand Corp. At the same time, **Carl O. Hoyer**, vice president of manufacturing, engineering and development, has been moved up to senior vice president of administration and control.

Leo Friend has been appointed director of chemical engineering development by The M. W. Kellogg Co. In his new capacity, Friend manages all pilot-plant, process development, and technical data groups of the firm.

Raymond B. Aufmuth, chief engineer and a director of The H. K. Ferguson Co., has been elected vice president of engineering. **William G. Cronk**, former director of research and development, was simultaneously promoted to manager of the firm's Eastern district.

E. Ernest Lindsey, professor of chemical engineering and head of the department at the University of Massachusetts, has been appointed an associate dean of the university. He works with Dean George A. Marston in administering the program of the School of Engineering.

W. D. Manly is the new director of Oak Ridge National Laboratory's Experimental Gas Cooled Reactor program. The EGCR, a \$40-million power reactor, is currently under construction.

Francis Olmsted has joined Cabot Corp. as assistant to the vice president of development. He comes from the post of vice president of development for U.S. Industrial Chemicals Co.

Eugene P. Schoch, professor emeritus of chemical engineering and founder of that department at the University of Texas, passed away on August 15 in Austin. He was 89. Best known in the CPI by his electrical discharge process for hydrocarbons conversion (the acetylene process), he had served for 60 years on the university's faculty before retiring in 1954.

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RING



FINE GRIND DRY MATERIALS



SHRED FIBERS

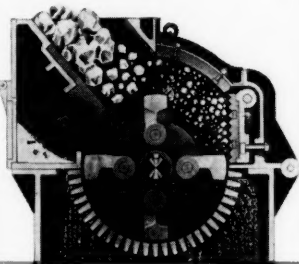


RECLAIM WASTE MATERIALS

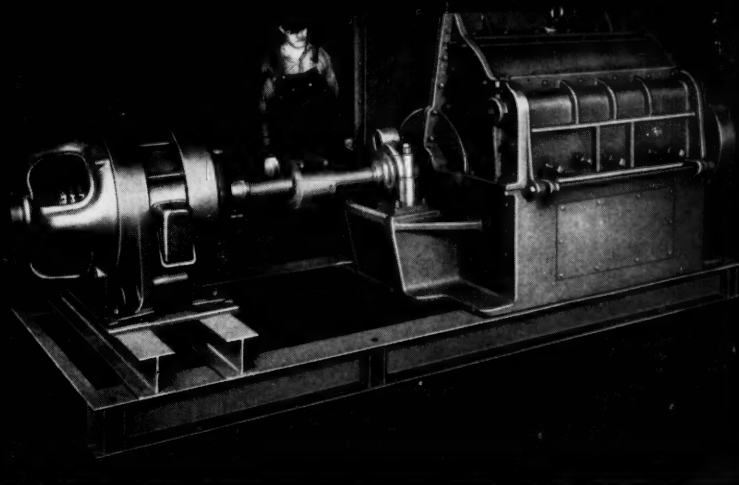


PROCESS WET STICKY MATERIAL

Sectional view of NF and GA type hammer mills, two of many Williams builds. Whether your operation involves grinding, crushing or shredding, Williams can furnish a mill to meet your exact requirements.



What do you want to CRUSH, PULVERIZE or SHRED ?



A WILLIAMS HAMMER MILL CAN DO IT FASTER AND BETTER FOR LESS

Whether the material is mineral, chemical, animal or vegetable, Williams has a type and size of hammer mill to reduce it from original state to finished size in a single operation!

One Williams mill can do the work of two or more machines—**SAVE UP TO 50% ON PRODUCTION COST** in labor, power and upkeep—**REDUCE ORIGINAL INVESTMENT AS MUCH AS 75%** in primary or secondary units, drives, conveyors, foundations and other equipment.

Superior engineering and stronger construction also pay extra dividends in years of added

service, less downtime, fewer replacement parts. Welded, massively reinforced steel plate frames—manganese steel liners and breaker plates—oversize shafts and discs—oversize, sealed, self-aligning bearings—all give optimum resistance to shock and abrasion. Quick, easy accessibility to interiors reduces maintenance time and trouble. Many more exclusives, unavailable in other equipment, promise ultimate economy, increased output and product improvement.

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Oldest and largest manufacturers of hammer mills in the world



NEW CERAMIC MAGNET

Level Switches

FOR LIFETIME SERVICE . . .
MULTIPLE FUNCTIONS

Start pumps, open or shut valves, sound alarms automatically . . . with these new high-load "Level-Ac" liquid level controls by Robertshaw, actuated by ceramic permanent magnets.

Designed for open or pressurized systems, these float-type switches provide constant control of levels in boilers, process vessels or other containers, with a long list of major advantages:

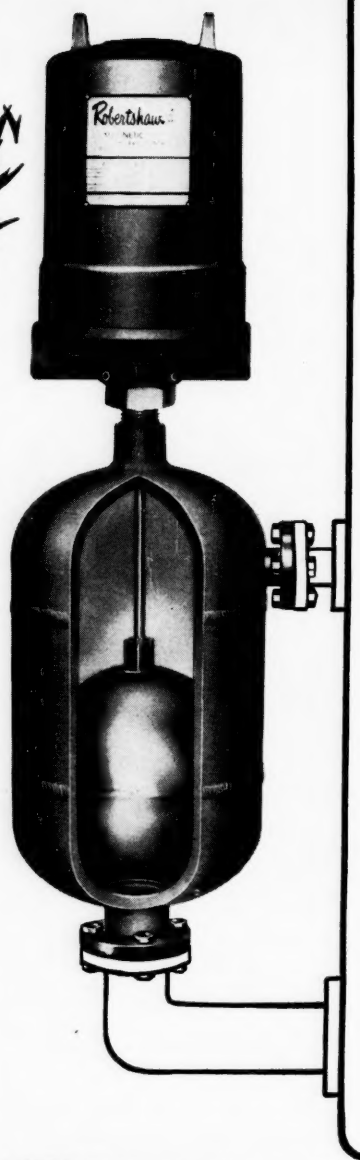
- **Extreme resistance to demagnetization** . . . highest of any commercial magnetic material.
- **Multiple switching functions** (up to 7 combinations) in small housing due to higher concentration of magnetic force.
- **Pneumatic or electric models** . . . explosion-proof housing available for electric switches.
- **Wide pressure range** . . . pressure-equalizing floats for high-pressure applications.
- **Fewer moving parts** for trouble-free operation, lower cost.
- **"High-load" snap switch** . . . avoids need for leveling.
- **Choice of mountings** . . . all-welded or flanged external float cages; top-mounting with tubular or 3-rod guides; side-mounting.

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Robertshaw-Fulton Controls Company

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Convention Calendar

September

24-27. American Institute of Chemical Engineers, National Meeting, Lake Placid, N. Y.

24-27. American Society of Mechanical Engineers, Petroleum Mechanical Engineering Conference, Muehlebach Hotel, Kansas City, Mo.

24-27. American Institute of Electrical Engineers, American Society of Mechanical Engineers, National Power Conference, St. Francis Hotel, San Francisco, Calif.

25-28. American Welding Society, Fall Meeting, Adolphus Hotel, Dallas, Tex.

25-28. Industrial Building Exposition & Congress, New York Coliseum, New York, N. Y.

28-29. American Production and Inventory Control Society, 4th Annual National Conference and Technical Exhibit, Pick-Congress Hotel, Chicago, Ill.

28-30. American Society for Quality Control, Chemical Div., 5th Annual Chemical Conference, Daniel Boone Hotel, Charleston, W. Va.

30-8. Italian Chemists National Assn., 1st Exhibition of Chemical Equipments, Milan, Italy.

October

2-3. Engineers Council for Professional Development, 29th Annual Meeting, Sheraton Seelbach Hotel, Louisville, Ky.

2-7. International Astronautical Federation, 12th International Astronautical Congress, Washington, D. C.

3-4. Southern Research Institute, Coal Technology Conference, Birmingham, Ala.

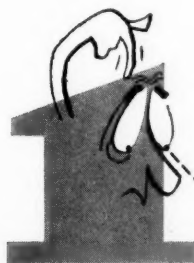
4-6. American Society of Mechanical Engineers, Process Industries Conference, Shamrock-Hilton Hotel, Houston, Tex.

5-7. American Society of Mechanical Engineers, American Institute of Mining, Metallurgical and Petroleum Engineers, 24th Annual Joint Solid Fuels Conference, Dinkler-Tutwiler Hotel, Birmingham, Ala.

6-7. American Society for Engineering Education, Annual North Midwest Meeting, Michigan College of Mining and Technology, Houghton, Mich.

8-11. American Institute of Mining, Metallurgical and Petroleum Engineers, Society of Petroleum Engineers, Fall Meeting, Dallas, Tex.

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CEILCOTE CORROSION-PROOF MONOLITHIC FLOORING GIVES YOU GUARANTEED PERFORMANCE!

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Ceilcote provides corrosion engineers to analyze your problems . . . produces the correct grade of Corocrete . . . prepares the surface and installs the flooring . . . all under one contract! Available with finishes ranging from non-skid to polished surfaces, Corocrete floors resist acids, alkalis, impact . . . are engineered to withstand thermal shock and expansion without cracking or spalling.

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Please send me complete information about your complete flooring service.

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8-12. Water Pollution Control Federation, Milwaukee Auditorium and Schroeder Hotel, Milwaukee, Wisc.

9-11. Technical Assn. of the Pulp & Paper Industry, Plastics Paper Conference, French Lick-Sheraton Hotel, French Lick, Ind.

9-15. American Rocket Society, Space Flight Report to the Nation, New York Coliseum, New York, N. Y.

10-12. 2nd Conference on Nuclear Reactor Chemistry, 5th Conference on Analytical Chemistry in Nuclear Reactor Technology, Oak Ridge National Laboratory, Gatlinburg, Tenn.

10-13. 15th National Conference on the Administration of Research, University of Puerto Rico, San Juan, Puerto Rico.

11-12. CHEMICAL ENGINEERING and Armour Research Foundation, Conference on the New Trends in Chemistry, Sheraton Towers Hotel, Chicago, Ill.

11-12. Western Petroleum Refiners Assn., Waste Disposal and Stream Pollution Conference, Hotel Lassen, Wichita, Kan.

11-13. The Fiber Society, Fall Meeting, U. S. Hotel Thayer, West Point, N. Y.

16-19. American Vacuum Society, 8th Annual Symposium, Washington, D. C.

16-19. Technical Assn. of the Pulp and Paper Industry, 16th Engineering Conference, Shoreham Hotel, Washington, D. C.

16-20. National Safety Council, 1961 National Safety Congress and Exposition, Chicago, Ill.

17-19. Plastics Show of Canada, Automotive Bldg., Toronto, Canada.

17-19. American Society of Lubrication Engineers, American Society of Mechanical Engineers, Joint Lubrication Conference, Morrison Hotel, Chicago, Ill.

18-20. The Packaging Institute, 23rd Annual National Packaging Forum, Biltmore Hotel, New York, N. Y.

19-20. Illinois Institute of Technology, 1961 National Conference on Industrial Hydraulics, Sherman Hotel, Chicago, Ill.

Later

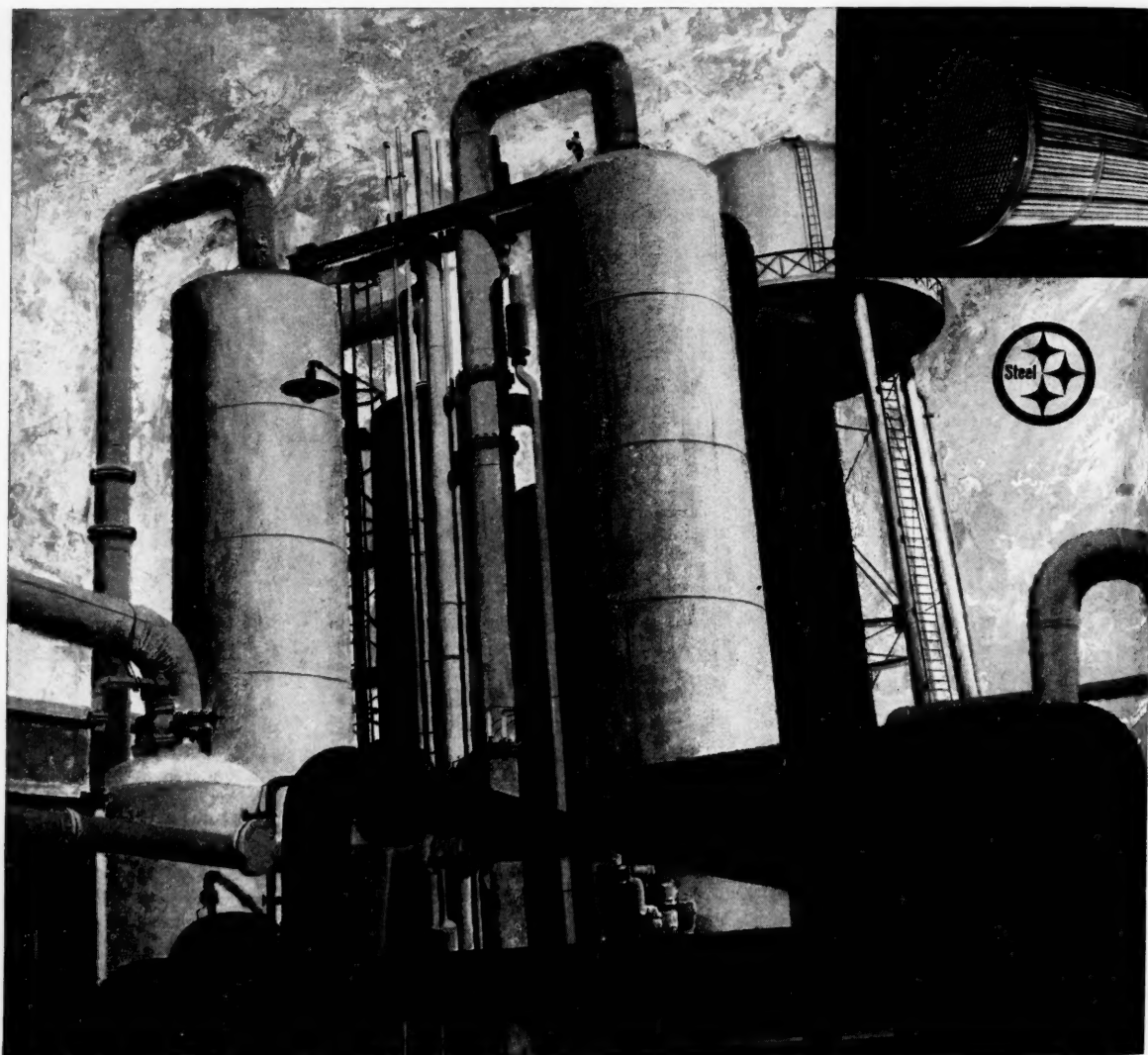
November 27-December 1. 28th Exposition of the Chemical Industries, New York Coliseum, New York, N. Y.

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Manufactured in our modern plant to ASTM specifications, both A-214 (carbon) and A-249 (stainless), under exacting quality control by experienced "Tubemen" . . . finally tested by the latest facilities (both hydrostatic and eddy current), welded steel heat exchanger tubing by The Standard Tube Company offers reliability . . . dependable performance.

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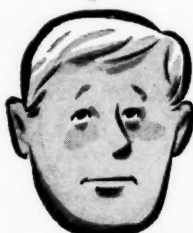
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... with the same proven solution . . . PITTSBURGH ACTIVATED CARBONS

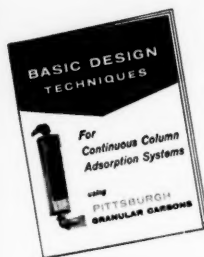
If you have an adsorption problem, chances are you can solve it more *efficiently* and *economically* with Pittsburgh Granular Activated Carbons.

What's more, our Technical Representatives are ready to show you *how*. Without obligation, they'll evaluate your present system . . . or help your people set up a laboratory column to demonstrate the dramatic adsorption efficiency of Pittsburgh carbons.

Pittsburgh coal-derived granular carbons are now at work in scores of continuous column adsorption systems, increasing efficiency and lowering costs in a wide variety of applications. And, chances are, they can do the same for you!

Call or write us the details of your adsorption problem today. It's the first big step to an improved adsorption operation in *your* plant.

3278



New! Basic Design Guide for Continuous Column Systems

This new illustrated booklet provides basic design data for planning both liquid and vapor phase continuous column adsorption systems. Write for yours today . . . it's free.



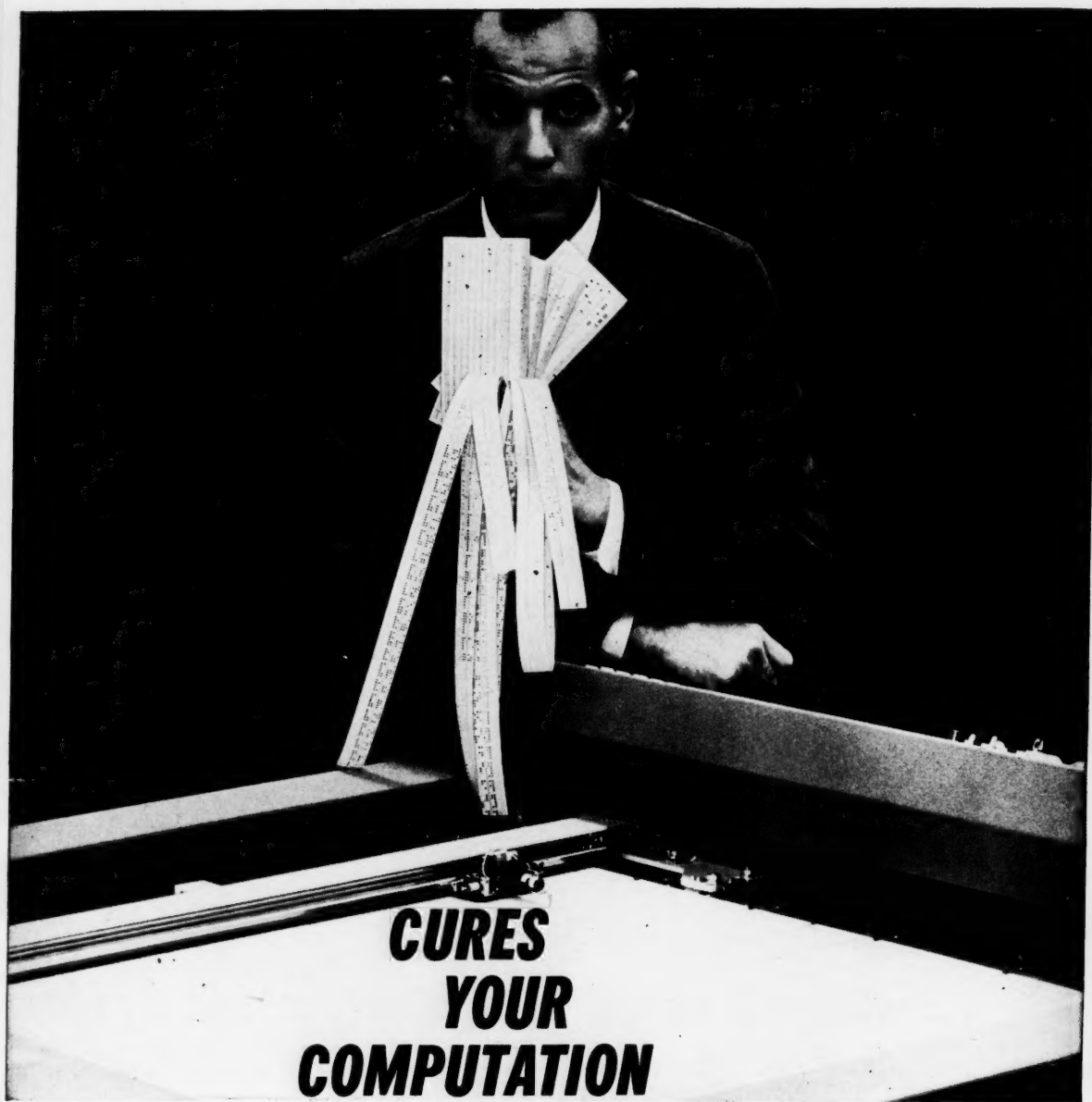
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CHEMICAL ENGINEERING—September 18, 1961

239



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Coupled with temperature, pressure and velocity, some waters can chew up condenser tubes faster than you would believe possible. Minute differences in oxygen, chemical or biological content give each a corrosive character of its own that calls for well-informed tube alloy selection.

Case histories in which tube life has been increased from months to *years*—or from years to many *more* years—are packed in Bridgeport's files. The training and experience of our corrosion specialists can help match the best tube alloy to your water supply—whether potable, saline, brackish or polluted.

Write for information on Bridgeport's regular or Duplex tubes—or call in a Bridgeport man for quick and practical assistance on your corrosion, erosion or bio-fouling problems.

Bridgeport condenser and heat exchanger tubes in over 50 metals and alloys:

INHIBITED ADMIRALTY
INHIBITED ALUMINUM BRASS
INHIBITED MUNTZ METAL
70-30 CUPRO NICKEL
90-10 CUPRO NICKEL
DEOXIDIZED ARSENICAL COPPER
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RED BRASS
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...plus **DUPLEX TUBES**...in combinations of the above alloys, with carbon or stainless steel, aluminum, Monel,[®] nickel...or other metals.

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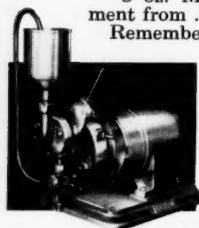


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\$75⁰⁰
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Find out for yourself how a Gaulin Homogenizer or Colloid Mill can improve your product and lower processing costs. You can rent one for only a few dollars a day.

Gaulin Laboratory Homogenizers — maximum capacity — 15 gph; minimum processable sample — 1 pint; pressure to 8,000 psi continuous; 10,000 psi intermittent.

Colloid RE Mill Model 2A — Capacity — 0-310 gph; minimum processable sample — 8 oz. Micrometer adjustment from .001 to .040.



Remember, the rental cost is applicable against the purchase price of the machines. Write for Laboratory Homogenizer Bulletin LH-55; RE Colloid Mill Bulletin — C-57.



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MANUFACTURING CO., INC.
71 Garden St., Everett 49, Mass.

World's largest manufacturer of stainless steel reciprocating pumps, pressure exchange pumps, dispersers, homogenizers and colloid mills.

NEW EQUIPMENT . . .

Continued from page 94

shutoffs and close valve positioning; the other has fail-safe features.

Available in body sizes of $\frac{1}{2}$, $\frac{3}{4}$ and 1 in., the valves come in a full range of materials and body ratings, with both screwed and flanged connections.—Valve Div., Minneapolis-Honeywell Regulator Co., Fort Washington, Pa. 94D

Three models have capacities from 100 to 6,500 gph.—Centrico, Inc., Englewood, N. J. 242A



Polyester belts

Ultrasonic splicing equipment makes endless plastic belting.

Polyester belts for industrial use are being offered in any length, with widths up to 60 in., thicknesses from 1 mil. A variety of different belts can be supplied on special order, or material furnished by the customer can be spliced.

The particular advantage of these belts, says the manufacturer, is that they possess the desirable characteristics of polyester plastics without the disadvantages of a cemented splice. Welding is done ultrasonically, resulting in a joint not much larger than the material itself and possessing 90-100% of the material's strength. Joint thickness does not exceed mill thickness of the belting material by more than 10%. Orientation of the plastic is preserved. — International Ultrasonics, Inc., Cranford, N. J. 242B

Automatic de-sludger

Unit continuously recovers solids from a wide variety of sludges.

Designed for applications in the chemical and food processing industries, automatic de-sludgers can be used to separate polyolefin solids from solvent streams, as well as recover various hydroxides, sulfates and other precipitates. This type of machine is already being used for continuous clarification of fruit and citrus juices; baby foods; wines; coffee, tea and biological extracts; and pharmaceuticals.

The automatic de-sludger periodically ejects sludge while operating continuously. The desludging cycle can be controlled manually or by an automatic timer that can be set for periods from 45 seconds to several hours. All models feature complete and partial de-sludging, in which only solids are ejected, with no loss of fluid.

Control system

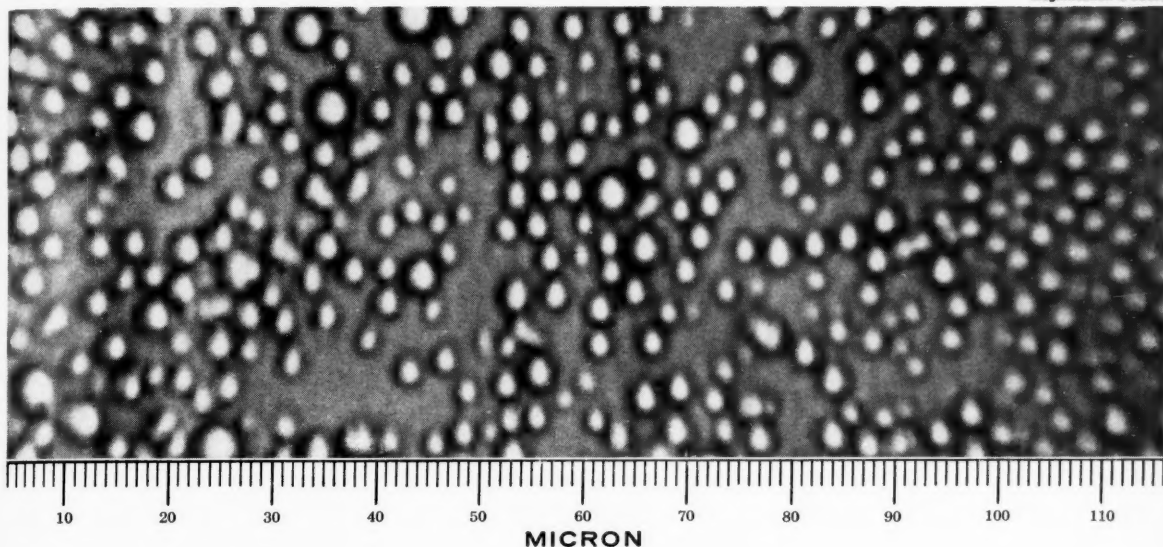
Thermistor/thermocouple devices enhance temperature control.

Continuous process temperature control at various locations is combined with indication at a central point in a thermistor/thermocouple system that includes the inherent advantages of each transducer.

Each probe contains a thermistor sensor and a thermocouple. The former is sensitive to temperature change and doesn't require expensive circuitry, while the thermocouple is stable over an ex-

Gaulin Particle Control

Magnification is 900X



The Secret of Improved Products at Lower Costs

Important improvements can be made in the physical properties of your product through controlling its particle size.

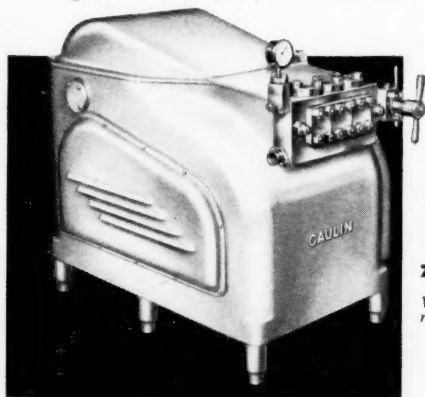
By reducing particles to their ultimate size you can improve everything from the speed with which it chemically reacts, to its taste, its lubricity and its color.

And by using Gaulin precision dispersers and emulsifiers you can maintain this particle size within very narrow limits — obtain greater uniformity at a far lower cost.

Gaulin Technical Assistance gives you a chance to fully explore the advantages of particle control.

Since we manufacture a complete line of homogenizers from (0-8000 PSI), colloid mills and submicron dispersers, we can provide you with the best means for achieving the particle size you desire.

See the *Chemical Engineering Catalog* for the address of your nearby Manton-Gaulin Industrial Sales Representative.



MANTON

Gaulin

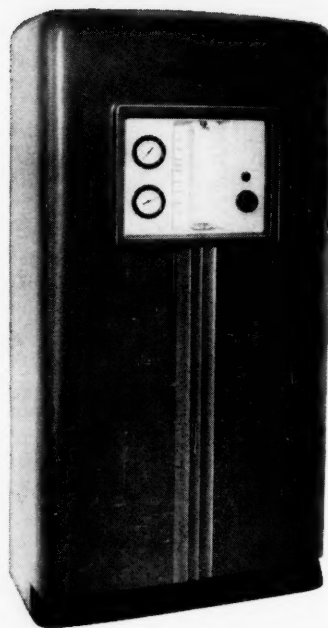
MANUFACTURING CO., INC.

71 Garden Street Everett 49, Mass.

World's largest manufacturer of stainless steel
reciprocating pumps, pressure exchange pumps,
dispersers, homogenizers and colloid mills.

Gaulin Technical Assistance starts with the GTA Library of Product Information. Ask for special bulletins prepared on each type of equipment. Then call on Manton-Gaulin for our specialized Technical Assistance. There's no obligation.

Solve
your
industrial
water
and
waste
problems -



W&T V-notch Chlorinators

Wallace & Tiernan V-notch chlorinators provide the economical answer to water- and waste-treatment problems. Chlorine's bacteria- and slime-killing power keeps process and cooling waters slime-free. It destroys cyanide and phenolic wastes. It helps prevent organic fouling of demineralizers.

This Series A-721 V-notch Chlorinator feeds up to 8000 lb./day, over a 20:1 range. It will treat nearly 100 million gallons of water with 10 ppm dosage... destroy 1200 lb. of cyanide waste... oxidize 800 lb. of ammonia nitrogen. Other V-notch models feed smaller amounts of chlorine, to 10 lb./day. All models can be used for manual, intermittent start-stop, or fully automatic operation. And the V-notch Variable-Orifice gives you pinpoint control.

- *If you have a water or waste treatment problem, W&T has the equipment and know-how to solve it. Write Dept. S-148.29.*

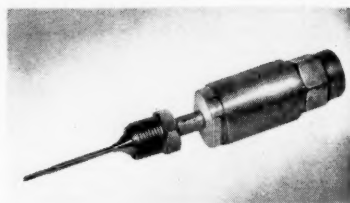


NEW EQUIPMENT . . .

tended period of temperature measurement.

A transistorized temperature controller, or alarm module, is permanently connected to each thermistor sensor. Once the set point for the control/alarm is set on the calibrated dial, the point is monitored continuously.

Thermocouple leads from each of the probes are brought to a central switchbox and then to a potentiometric indicator. High reliability of the dual system is claimed because the two circuits operate independently and check each other. — Atkins Technical Inc., Cleveland. 242C



Pressure thermocouple

Good to 75,000 psi., it has a flat tip to minimize material buildup.

Designed for installation in a pipe carrying polyethylene at 50,000 psi., a unique thermocouple has a flat tip at the hot junction. When oriented in the same plane as the flow of material, the screw-driver tip minimizes buildup.

Tested to 75,000 psi., the miniature assembly uses a 1/4-in. sheathed element that contains 30-gage thermocouple wire. To withstand high pressure, the element is swaged to fit against a shoulder inside the adapter.—Trinity Equipment Corp., Cortland, N. Y. 244A

Pneumatic instruments

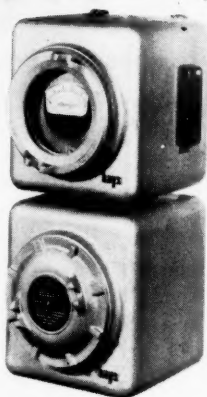
Miniature units simplify transfer from manual to automatic control.

Manual - to - automatic transfer does not require an operator to match pressures in a series of 4-in. indicating, recording and control-

ling devices that are pneumatically actuated. Hence, resetting of a primary controller's set point by a secondary controller becomes practical for the first time, according to the manufacturer.

The line includes 1- and 2-pen strip-chart recorders with or without control, single- and 2-station recording cascade control, 1- and 2-point indicators with or without control, a proportional plus reset controller, and a proportional plus reset plus rate controller.

All the devices operate over the conventional 3-15 psi. pneumatic range, and may be combined with any compatible transmitter and final control element. Recorders have color-coded pointers to match inks for easy identification of variables.—Brown Instruments Div., Minneapolis-Honeywell Regulator Co., Philadelphia. 244B

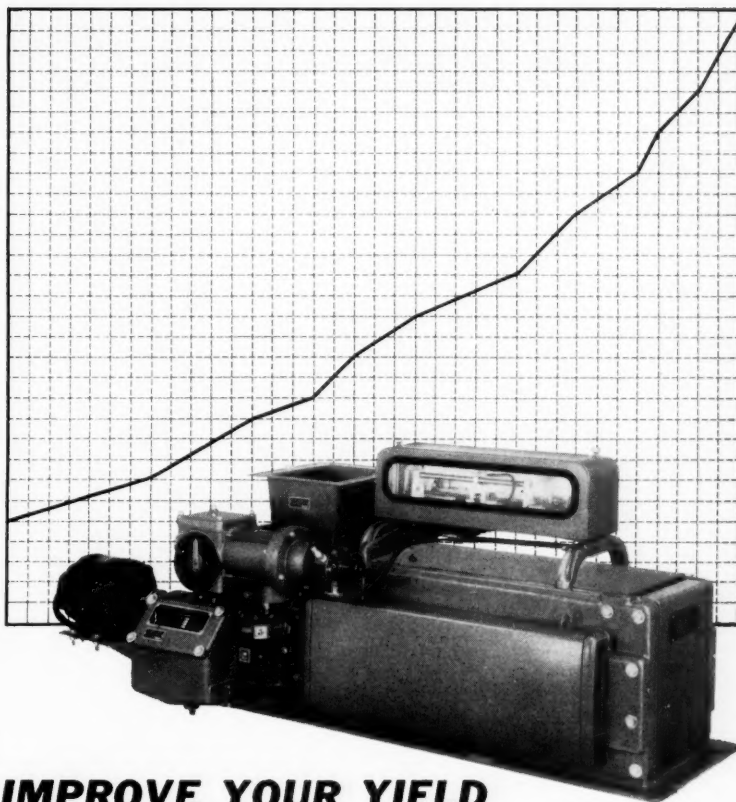


Oxygen analyzer

Low-range unit for gas mixtures is explosionproof, accurate to 2%.

Not affected by the presence of hydrogen or other hydrocarbons in the background gas, an explosionproof oxygen analyzer applies a principle involving oxygen attraction by a magnetic field to achieve $\pm 2\%$ accuracy in ranges from 0-1 through 0-10%.

In operation, gas that is drawn into the magnetic field is heated, which in turn cools the winding. As more gas is drawn in, the previously warmed (and less mag-



IMPROVE YOUR YIELD WITH 99% FEEDING ACCURACY... THE W&T MERCHEN FEEDER

If you need accurate control of dry, free flowing materials to keep process yields high, count on the W&T Merchen Feeder. The Merchen controls dry flow to a hairsbreadth, hour after hour.

Pick any minute any time in your run. Pick one at high capacity, another at low capacity. The Merchen holds accuracy to $\pm 1\%$ from minute to minute . . . stretches the minutes into hours of precise feeding. You solve tough feeding and continuous-blending problems, get sure quality control.

Accuracy comes from sensitivity. And a change of just one ounce in a 63-pound belt load actuates the Merchen's control mechanism. It responds instantly. Accuracy is assured.

This versatile Wallace & Tiernan Feeder has other advantages: It's a straight gravimetric feeder; it feeds and controls other equipment; or it feeds in proportion to any 3-15 psi signal. Corrosion-resistant construction lets it handle most chemicals. And even the largest model occupies less than 3 x 5 feet of floor space.

For more information, write Dept. M-64.29.



WALLACE & TIERNAN INC.

25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

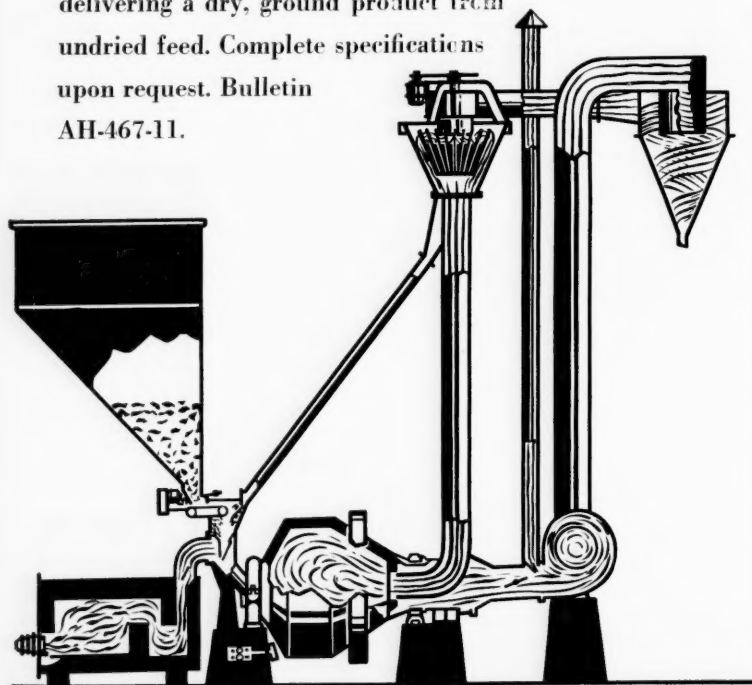
change from . . .
40 MESH
 to
400 MESH

. . . in a few minutes, without interrupting operations. Yet any desired mesh may be maintained continuously. Ease of adjustment and close product control are possible with the . . .



Gyrotor® Air Classifier

The Hardinge Gyrotor Classifier system, combined with a Hardinge grinding mill is an integrated grinding, classifying and product conveying system. Also available with an air-heating furnace for delivering a dry, ground product from undried feed. Complete specifications upon request. Bulletin AH-467-11.



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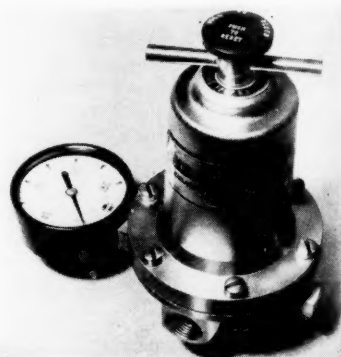
"Hardinge Equipment—Built Better to Last Longer."

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NEW EQUIPMENT . . .

netic) gas is forced past a second winding, which is cooled somewhat less than the first. The temperature difference between the windings is interpreted as percent oxygen.

The device has no moving parts, features a built-in indicator. When coupled with a suitable sampling system, the unit provides fast response—4-7 sec.—to fluctuations in oxygen content.—Hays Corp., Michigan City, Ind. 245A



Pressure regulator

Unit's off-on switch does not disturb pressure setting.

The incorporation of a button control feature into a standard pressure regulator now makes it possible to cut gas flow on and off without disturbing the pressure adjustment.

When button control is in "off" position, downstream pressure drops to zero; when control is returned to "on", pressure returns to original setting.—Benbow Mfg. Corp., Culver City, Calif. 246A

Cutoff valve

Designed for fire protection, unit mounts in any position.

Used to shut off the flow of flammable liquids to fire areas, this stainless steel valve closes at a preselected temperature. The bolted-bonnet valve is held open against the force of two stainless steel springs that are connected by a fusible link. When the preset

you can see the sense to

HILLS-McCANNA DIAPHRAGM VALVES

for automatic
and remote process
flow control

Here is economy...simplicity...reliability
... accuracy for even your most difficult
applications

WIDE RANGE OF AIR OPERATOR SIZES—no need to buy
more operator than needed for a given size valve.

DRIPTIGHT SHUTOFF—will close tightly even against
solid particles in the line.

ACCURATELY CONTROLLED THROTTLING — valves
available with positioning devices for consistently repro-
ducible control accuracy.

TYPES FOR EVERY JOB—including air open—air close, air
open—spring close, and spring open—air close operation.

WORKING PARTS completely isolated from flow.

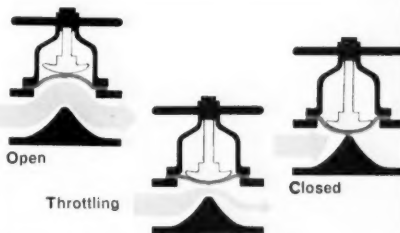
BODY AND DIAPHRAGM MATERIALS to handle paper
pulp, acids, alkalies, oils, foods, beverages, fats, slurries,
semisolids, viscous materials, compressed air, gases,
volatiles, atomic reactor wastes, fuels, and hundreds of
other fluids.

1/2" THROUGH 16" VALVE SIZES—with screwed, flanged,
socket weld, and special end connections—for pressures
to 150 psig and temperatures to 400° F.

ASK FOR NEW BULLETIN NO. 134-A giving
complete selection data. Write for your
copy today or call your nearby Hills-
McCanna distributor.



Valves can be serviced
without removing body
from the line.



Accurate control plus bubble-tight clo-
sure even against solid particles which
might lodge on valve seat. No packing—
no leakage around stem.

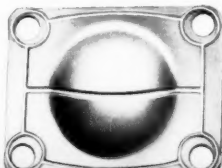
HILLS-McCANNA COMPANY

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Valves and parts stocked nationwide
by leading industrial distributors.

What these valves
really control
is cost!

Tough, resilient
diaphragms
available in a
wide range of
elastomers and
plastics, includ-
ing Chlorobutyl
and solid Teflon.



you can see the sense to
HILLS-McCANN
BALL VALVES

for automatic
and remote on-off
control

The only ball valves for service from -150° F to 1000° F

One look at a Hills-McCanna ball valve with pneumatic or electric operator tells you why it is a natural for remote flow control:

QUARTER-TURN OPERATION—permits use of a simple, economical, quick-acting operator.

LEAKTIGHT—line pressure forces closed ball tightly against downstream seat. Stem sealing is solved by twin seals illustrated below.

REMARKABLE VALVE WEAR LIFE because of smooth non-abrading contact between metal ball and nonmetallic seats.

1/4" THROUGH 12" SIZES—screwed, socket weld, flanged ends . . . pressures from 10⁻⁶ mm Hg to 1000 psig . . . temperatures from -150° F to 1000 F° . . . wide range of body materials for corrosive and noncorrosive services. "Fire-Seal"® seats available for leaktight closure under excessive temperatures.

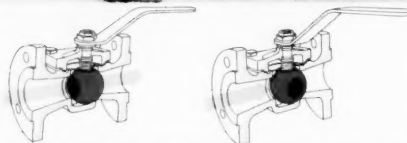
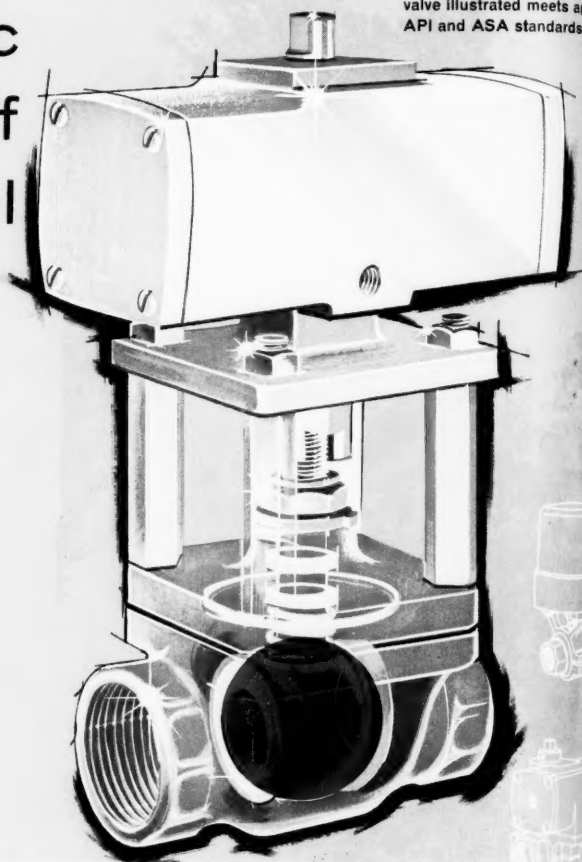
PNEUMATIC OPERATORS—optional accessories include a solenoid valve for electrical control, limit switch for remote on-off operation, and a fail-safe device to return valve to open or closed position in event of air system failure.

ELECTRIC OPERATORS—weatherproof, explosionproof, rugged, and reliable.

SEND TODAY FOR NEW 32-PAGE CATALOG giving complete specifications and service recommendations for Hills-McCanna ball valves—manual and motor operation.



McCANNASEAL® top-seal valve illustrated meets applicable API and ASA standards.



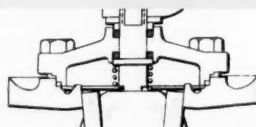
QUARTER-TURN OPERATION; low pressure drop. When the big, round, turbulence-free orifice is in line with the pipe, valve is wide open. A quarter-turn closes it completely against flow in either direction.

HILLS-McCANN COMPANY

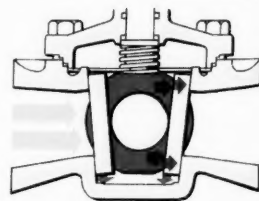
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Valves and parts stocked nationwide by leading industrial distributors.

What these valves
really control
is cost!



STEM SEALING IS SOLVED—two seals are under compression by the stem nut which can be tightened to compensate for wear. Lower seal is back-seated—line pressure works with it to prevent



NO FLOW LEAKAGE—line pressure forces closed ball tightly against the downstream seat. The seat seals against the valve body.

"WEDGE-SEAT" DESIGN of McCannaseal valve compensates for wear—ball and seats are continuously wedged down into body under pressure of long-lived, corrosion-resistant, nonflexing, nontorsional spring.

NEW EQUIPMENT . . .

temperature is exceeded, the link melts, allowing the springs to snap the valve shut.

Having no counterweights or interior bellows, valve assembly can be installed in any convenient position. A rotating double-disk assembly maintains tight seal despite body distortion from heat. Other features include a retained bonnet gasket, one-piece stem and disk carrier, and perforated-metal cage around valve.

Models are offered in sizes from 1/2 to 6 in., with flanged-end bodies of types 304, 316 and other stainless steels, for use to 150 psi. Fusible links are available for various temperatures. — **Cooper Alloy Corp., Hillside, N. J. 246B**



Potentiometer recorder

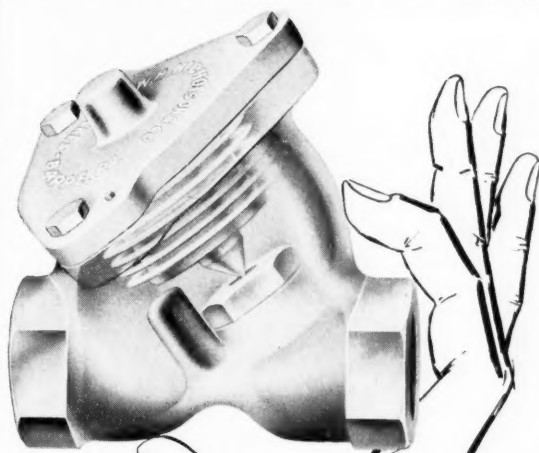
Portable unit has wide range of chart speeds, input circuits.

This handy self-balancing potentiometer can be easily carried to where it's needed and set up to record a wide range of information. It is also available in a panel-mounted version.

Called Recordette-4, the unit has three speed ranges, from 1 to 60 in./hr., employs either ink or inkless recording. Electrical span is adjustable between 10 and 100 millivolts full scale. Thermocouple, step attenuator and zener reference input units are also available.

The 17-lb. unit carries 60 ft. of 4-in. calibrated chart that may be collected on a conventional takeup roll or fed out through a slot in the bottom of the door to be torn

This **LITTLE** trap does a **BIG** trapping job — and reduces the cost of discharging condensate



NEW NICHOLSON N-150 THERMOSTATIC STEAM TRAP

- ... All steel construction for rugged durability.
- ... Design simplified for quick, low cost maintenance.
- ... Compact, lightweight, easily installed. Can be inspected without breaking pipe connections.
- ... Equipped with Nicholson steam-saving Baffle*.



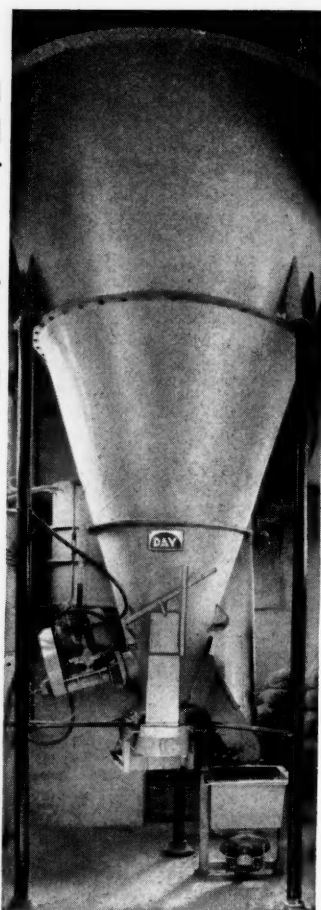
For lowest cost-per-pound of condensate handled, this trap is by far your best buy. Like all Nicholson Thermostatic Traps, it opens **ONLY** when necessary . . . that is, when sufficient condensate collects in trap body to surround the Monel bellows . . . **ONLY** then does the pressure inside the bellows reduce below line pressure, the resulting differential causing bellows to contract and instantly activate complete discharge. Body is cast steel and cover forged steel. Cover screws, valve and valve seat are hardened stainless steel. Just *one* working part, so maintenance is practically nil. In 1/2" and 3/4" sizes. For pressures from vacuum to 150 psig. Write for details, including the name of the Nicholson man in your area.

*Patent applied for

W. H. NICHOLSON and COMPANY
12 Oregon Street • Wilkes-Barre, Pa.



Now get
EXTREME
HIGH ACCURACY
MIXING
IN SHORT TIME
 with the
 revolutionary
DAY
NAUTA
MIXER*



UNIQUE 3-WAY MIXING ACTION of the DAY Nauta Mixer produces a greater degree of mixing accuracy in less time than any other known type of mixing equipment! Quick, uniform mixing is accomplished by a revolving screw that orbits around the wall of the conical container. A thorough dispersion is obtained in $\frac{1}{2}$ to $\frac{1}{3}$ the time required by most conventional mixers.

YOU'LL BENEFIT FROM THESE EQUALLY IMPORTANT ADVANTAGES:

- Starts under full load.
- Also handles small batches.
- Low horsepower requirements.
- Gentle action — no product damage.
- Uniform distribution regardless of specific gravity of materials.
- No stuffing boxes.
- Lump breaker device.
- Safe and sanitary design — cleans easily.
- Low heat generation.
- Deaerates the batch.
- No build-up on tank.
- Uses minimum floor space.

EASY ADDITION OF LIQUIDS — "Microjet" device permits addition of small amounts of liquids to large amounts of dry materials with complete homogeneity and without lump formation.

A SIZE TO FIT YOUR NEEDS — available in laboratory models and production sizes up to 925 gallons.

TEST THE DAY NAUTA MIXER with your batch ingredients in our laboratory. There is no obligation.

GET FULL DETAILS TODAY! SEND FOR NEW BULLETIN!



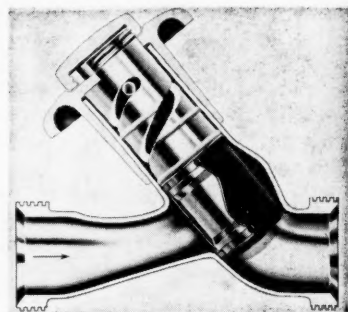
**Mfg. under license from N.V. Nautamix, Haarlem, Holland. Patented U.S.A.*



The J. H. DAY Co.
 Division of The Cleveland Automatic Machine Company
 QUALITY MIXING, BLENDING, MILLING AND SIFTING EQUIPMENT SINCE 1887
4926 BEECH STREET CINCINNATI 12, OHIO

NEW EQUIPMENT . . .

off for instant reference. Accuracy is $\pm 1\%$ of span.—Instrument Corp. of America, Baltimore. 249A



Boot-seal valve

Double seal shuts off liquid from valve neck when open or closed.

A dual-sealing boot provides leakproof sealing and simultaneously prevents liquid from getting up into the neck of a stainless steel valve designed for sanitary and chemical service.

With no metal-to-metal contact within the valve body, valve operation is essentially independent of wear due to abrasion, and the non-sparking assembly makes the valve suitable for use in explosive atmospheres.

The valve body is fabricated from polished stainless steel sheets, thereby reducing porosity and contaminating surfaces. Boots are available in materials resistant to petroleum products, chemicals, fruit and vegetable juices, and other food products. Temperature operating range is -60 to $+300$ F.—Stehlin Corp., Los Angeles. 250A

Explosionproof switch

Pressure-sensitive unit can be reset without exposing circuit.

Featuring a basic diaphragm unit with optional housings, this pressure switch reacts to pressures from 0.1 in. Hg to 150 psi. with a set and reset accuracy of $\pm 1\%$ guaranteed by manufacturer. Ranges of pressures to which the instrument reacts can be

ONE OF A SERIES OF CHATS ABOUT THE
CONSERVATION AND CONTROL OF HEAT

SARCO TOPICS

DOWNTIME DOWN —OUTPUT UP

Continuous processing . . . two big words in the world of chemicals . . . and one big headache when the processing has to stop unexpectedly. It's not just the pure pain in the neck that mechanical failure produces. It's the production costs that keep mounting during down-time.

Let's face it, no one can eliminate every bug. But steam trap failure is a bug there's no excuse for. Not since Sarco created the Thermo-Dynamic Steam Trap, Type TD-50.

For example, Reichhold Chemicals know how bugless it is. They have standardized on this unique steam trap in their new Maleic Anhydride plant at Elizabeth, New Jersey.

Of their 320 TD-50's, most are in service on 35-lb. steam tracer lines.

Results? Results!

For one thing, Reichhold has learned that TD-50's hardly know the meaning of the word downtime.

Then, too, maintenance people like them for their ease of inspection and



The character pretending to inspect one of Reichhold's TD-50's is Sarco's ad manager, who normally wears a gray flannel suit. We're happy to see strainers used properly on this 14-trap manifold to protect the steam traps, even if they don't happen to be Sarco strainers.

service. And TD-50's don't require high quality steam to function. We don't want to sound like an advertisement, but it's this way: the TD-50 is so simply designed it has only one moving part; its performance is uniform; it operates equally well on heavy, light, or no condensate load—even against back pressures up to 50% of inlet pressures; it's so rugged that superheat, water hammer, vibration, or corrosive condensate won't affect it; if you should ever want to service a TD-50, a highly unlikely prospect, you can unscrew the cap, clean it, blow it down, and have it back on stream in 40 seconds.

MR. BERNOULLI HELPS BUILD A BETTER STEAM TRAP

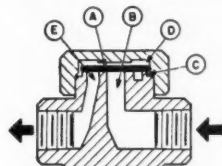
We may be a trifle tardy in bringing it up, but Daniel Bernoulli, who dreamed up the "Bernoulli Effect" about 250 years ago, deserves some sort of accolade from us here at Sarco. A plaque perhaps, or his name in the foyer floor tile. Daniel was a famous Swiss mathematical genius and he was probably a little hesitant about even mentioning his slightly offbeat discovery, the "Effect," in *Hydrodynamica* (1738).



If you happen to have a spool handy, you can perform the simple "effect" right at your desk. Lay a cardboard disc with a pin through it on the table. Place the spool over the pin and blow—hard—and lift. The disc won't fall until you stop blowing because the air under pressure expands between the end of the spool and the disc. The pressure in this space is actually less than atmospheric, and the sum of the downward forces is less than the upward force of atmospheric pressure acting upon the disc's bottom side.

Well, of course it *sounds* rather remote, but what seemed like a simple parlor trick to Bernoulli has made it possible for us at Sarco to solve steam trapping problems by the dozens. In our Sarco Thermo-Dynamic Steam Trap, Type TD-50, the cardboard disc is replaced by a stainless steel disc A, the spool tube by inlet tube B. The disc also acts as a valve and can seat on B, and also on outer seat ring C. When seated, the disc seals the inlet and the chamber D from the outlet E. Full attention now, because it could easily be *your* steam, condensate,

or air we're following here as it enters the trap, its pressure raising the disc and allowing fluid to flow radially across the underside of the disc. The velocity of air or condensate is comparatively low, exerting little influence on the disc, which remains



clear of the seat, allowing free discharge. Ah, but now steam enters the trap. Velocity increases greatly because of the steam's greater internal energy. Presto! The disc is pulled toward the seat just as was the cardboard. At the same time, the radial steam jet raises the pressure in D by recompression, snapping the disc down on the seat.

Downward force of recompressed steam in D, acting on the full area of the disc, is greater than the upward force of the inlet steam acting on the smaller area of the inlet orifice. So the disc remains seated, stopping all flow of steam, until pressure in D is reduced by condensation, and the cycle is repeated.

BEYOND THE TD-50 PRINCIPLE

Surprise! In spite of the one-track subject matter you've had the decency to ingest so far, we manufacture a good deal more than TD-50's. As a matter of proud fact, we are the only company that makes and sells all five types of steam traps. After all, there is a place for Balanced Pressure Thermostatic, Float Thermostatic, Camlift Bucket, and Liquid Expansion Thermostatic Steam Traps too. And our knowledgeable engineers can tell you exactly where to use what—and how.

And may we modestly add, that's only the beginning? As long as our present conversation seems to consist of product name dropping, we'll just mention the fact that we make exceptionally fine pressure and temperature regulators of rather astonishing variety and ingenuity. For example, we have a complete line of self-powered regulators for heating and cooling. And to make most effective use of these last few lines—strainers of all kinds—even hand and motor operated scraper strainer types. We could fill this page with lists of applications, testimonials, and specifications, but it would be eminently more sensible simply to say: Tell us your problem. Write us direct, or contact your local Sarco sales representative or sales office.

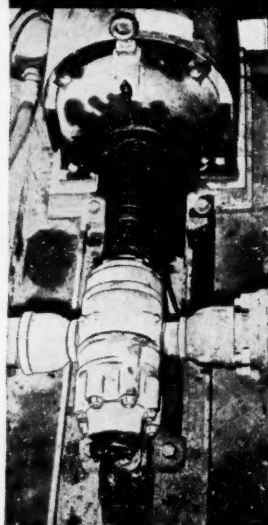
Pardon our monopolizing the conversation in this series of paid communiques, but we're trying our best to interest you in certain subjects that concern us both—to the point where you'll communicate.

5902

SARCO

SARCO COMPANY, INC.
635 MADISON AVENUE, NEW YORK 22, N. Y.
PLANT, BETHLEHEM, PA.
STEAM TRAPS • TEMPERATURE CONTROLLERS
STRAINERS • HEATING SPECIALTIES

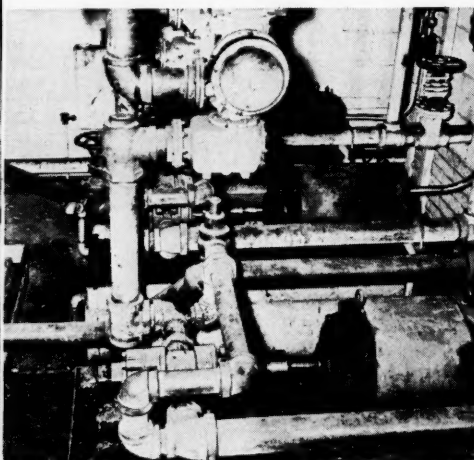
5 Sier-Bath GEAREX® PUMPS



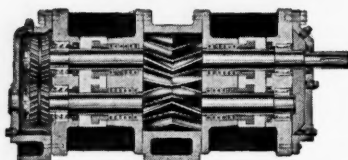
Pumping Hot Varnish 10 Years -- not one cent for repairs!

AT DE SOTO CHEMICAL COATINGS CORP.

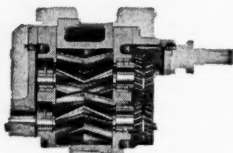
The only maintenance in 10 years has been several tightenings of the original packing, still in use without leakage. The Gearex Pumps are transferring 35 gpm. of hot varnish from tank trucks to storage tanks 5 hours a day. Varnish has a viscosity of 1800 to 7000 SSU at 70° to 160° F., pumped at 150 psig. De Soto is highly pleased with fast transfer service and complete absence of repair costs and shutdown losses.



Sier-Bath "Gearex" Pumps



EXTERNAL GEAR & BEARING TYPE
for non-lubricating liquids

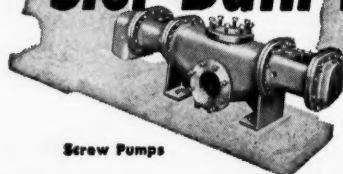


INTERNAL GEAR & BEARING TYPE
for lubricating liquids

Sier-Bath "Gearex" Pumps provide positive displacement, pulseless flow... quiet, vibrationless operation. Direct-connected up to 1800 RPM, they require no reduction gears. For high volumetric efficiency and long life there is no rotor-to-rotor or rotor-to-casing contact. Low pressure on stuffing boxes provides easy servicing.

Horizontal or vertical models to handle 32 to 5,000,000 SSU, 1 to 650 GPM, at pressures up to 350 psi. Corrosion-resistant alloys, steam-jacketed bodies, water-cooled bearings, other adaptations to meet individual needs. See "Yellow Pages" for your local Sier-Bath Pump Representative or send for Bulletin G-3. *Sier-Bath Gear & Pump Co., Inc., 9259 Hudson Blvd., North Bergen, N. J.*

Sier-Bath ROTARY PUMPS



Screw Pumps



Gearex® Pumps



Hydrex® Pumps

Founded 1905

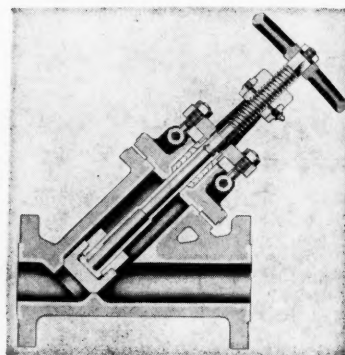
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Member A. G. M. A.

NEW EQUIPMENT . . .

changed by substitution of a variety of diaphragm capsules. Fine pressure adjustments are made by turning an external knob.

High-pressure diaphragm assembly (150 psi.) can withstand pressures up to 300 psi. Pressure connections are 1/2-in. female pipe fittings. — **Barksdale Valves, Los Angeles.** 250B



Plastic-lined valve

Inner parts and surfaces may be coated with various materials.

For corrosive service, a "Y"-type metal valve has all wetted and inner parts and surfaces—inside surface of body and bonnet, stuffing box and stem—protected by a heavy plastic lining.

Three plastic materials are available depending upon the fluid being handled, as well as the temperature and pressure operating ranges. Standard units are of cast carbon steel although special alloys can be obtained if necessary.

The valve comes in 1-3 in., with dimensions conforming to ASA Standard B16.5 for 150 psi.—**The Wm. Powell Co., Cincinnati.** 252A

Level transmitter

Device transmits d.c. signals that are proportional to level variations.

Said to combine the accuracy of mechanical measuring and the efficiency of electronic signaling, a liquid level transmitter is adaptable to all systems using electronic indicators, recorders, controllers.

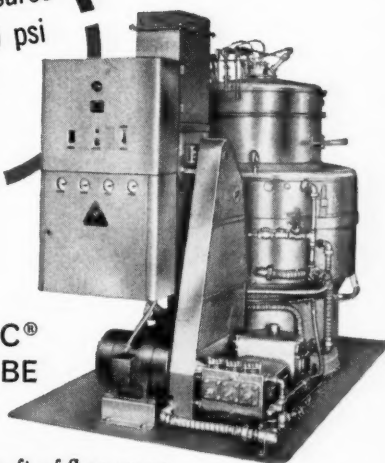
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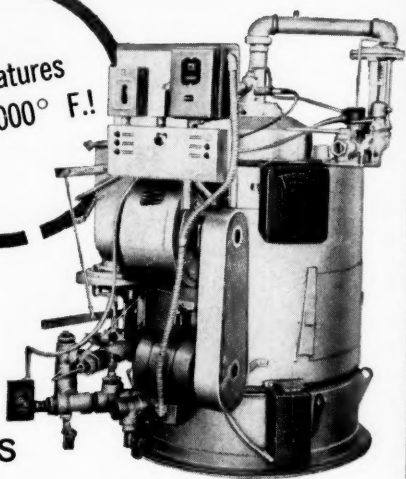
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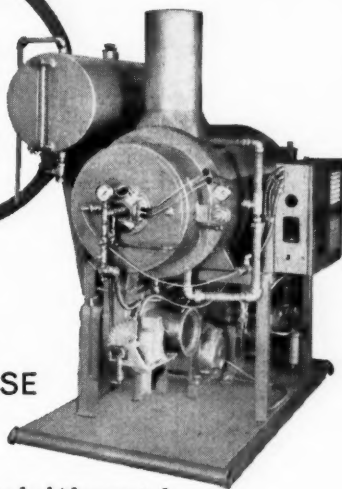
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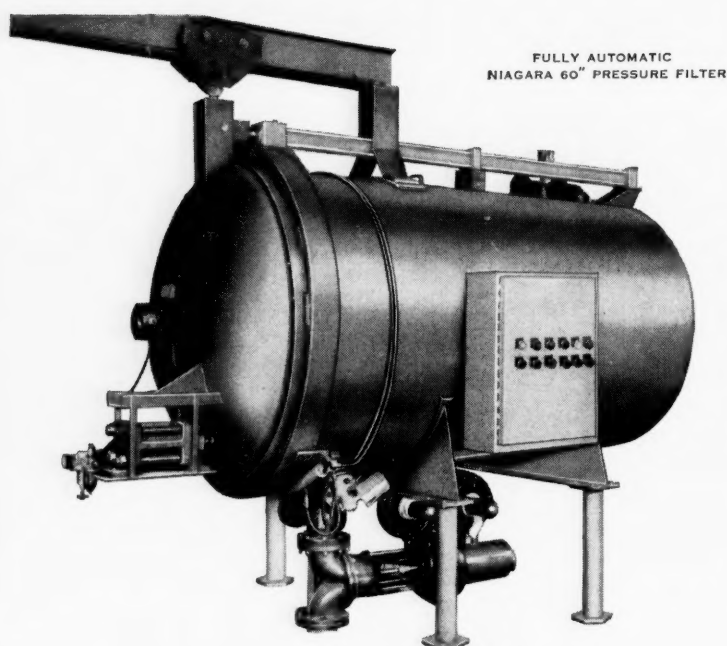
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NEW EQUIPMENT . . .

An electronic signaling device is coupled with a variable-displacement measuring element. Accuracy of 1% is claimed, even in changing ambient conditions. The unit is adaptable to all types of liquid-containing vessels.—**Mason-Neilan, Norwood, Mass.** 252B

Limit switch

Snap-action unit is designed for leakproof underwater operation.

Sealed to make it suitable for service in processing operations involving washing, steaming or highly humid environments, a waterproof limit switch is expected to give at least 1 million cycles without leaking.

Key element of the switch is a Delrin plunger that is sealed in a neoprene boot. The unit is available with wire leads potted in epoxy resin or spade terminals, along with actuators that snap to the nylon case.—**Controls Co. of America, Schiller Park, Ill.** 254A

Briefs

Level control can use any of more than 350 different probes, has single-knob calibration and printed-circuit design. Mounted up to 250 ft. from probe, unit gages liquids, solids, molten metal. — **Fielden Electronics, Inc., Huntington, L.I., N.Y.** 254B

MacroScope is a new optical system to fill the gap between microscope and common magnifier. Objects are viewed on a flat field in shadowless light in magnifications from 2.5 to 7X.—**EdnaLite Research Corp., Peekskill, N.Y.** 254C

Penton is now used to line corrosion-resistant pipe, valves, fittings and pumps. Supplementing existing saran-lined equipment, Penton raises upper temperature limits from 180-200 to 225-250 F. Cost is three times greater for Penton-lined equipment. — **Saran Lined Pipe Co., Ferndale, Mich.** 254D

Cryogenic check valve has essentially zero leakage from 3 to 1,500 psi. outlet pressure, cracks at 1 psi. Sized from 1-6 in., valve has less than 30-psi. pressure drop with 250-gal./min. flow of liquid O₂ in 1½-in. size.—Wallace O. Leonard, Inc., Pasadena, Calif. 255A

Centrifugal pump packing will withstand high pressures or excess gland pressures during breaking-in period. Braided asbestos packing contains a new lubricant said to be 35% more slippery than graphite. Lubricant forms a permanent film, withstands high temperatures.—A. W. Chesterton Co., Everett, Mass. 255B

Metal-faced sheet insulation combines efficient insulation material with diamond-rib sheet aluminum facing for applications requiring weather resistance. Supplied in 4x8-ft. panels, the insulation is secured with studs welded to the surface in a pattern to fit pre-drilled holes. — Johns-Manville, New York. 255C

Equipment Cost Indexes . . .

	Mar. 1961	June 1961
Industry		
Avg. of all.....	237.2	236.9
Process Industries		
Cement mfg.	231.3	230.9
Clay products	224.8	224.4
Glass mfg.	224.7	224.0
Paint mfg.	229.7	229.4
Paper mfg.	229.3	228.6
Petroleum ind.	234.7	234.8
Petroleum ind.	234.7	234.8
Rubber ind.	237.6	237.6
Process ind. avg.....	235.9	235.2
Related Industries		
Elec. Power equip.....	237.9	235.1
Mining, milling	239.4	238.7
Refrigerating	268.5	268.6
Steam power	224.9	225.0

Compiled quarterly by Marshall and Stevens, Los Angeles, for 47 different industries. See Chem. Eng., Nov. 1947, pp. 124-6 for method of obtaining index numbers; Mar. 6, 1961, pp. 115-116 for annual averages since 1913.



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Technical Bookshelf

BIG BOILER BOOK

BOILERS: TYPES, CHARACTERISTICS, AND FUNCTIONS. BY C. D. SHIELDS. F. W. DODGE, NEW YORK. 559 PAGES. \$15.

Reviewed by Donald Stewart, Foster Wheeler Corp., New York City.

The gap in knowledge between that presented in the regular textbooks on boilers and in engineering handbooks on the subject has now been filled.

Whereas textbooks properly emphasize the physical laws and mathematics of boiler design, and handbook information is confined to such items as tabulated data and practical formulas, this book covers the area between these two extremes, and covers it well.

A description is given of all types and classifications of boilers now in use, from the small domestic heating units to the most modern supercritical-pressure central-station boilers. A chapter on nuclear power is included. In addition to description of equipment, there is also discussion of construction details, operation, and design features and limitations of each type. Many excellent illustrations augment the text. Unfortunately there are a few typographical errors in references to illustrations, but this is a minor inconvenience.

In a section on design, the author discusses what constitutes good design practices and principles, and boldly makes comparisons and evaluations of various designs. This is unique in boiler literature as far as this reviewer is aware. Since every boiler design is a compromise with desirable but often incompatible features and economic considerations, there undoubtedly will be design engineers who will disagree with some of the statements. But this is a controversial area and universal agreement is probably not possible.

The final chapters survey the many codes, regulations, ratings, inspection and testing procedures that govern in the boiler field. This again is a consolidation of informa-

tion not usually found in boiler publications.

The author is careful to explain and define most of the technical terms used and, as is essential to a reference book of this kind, has prepared a comprehensive index.

RED HEARING

ULTRASONICS AND ITS INDUSTRIAL APPLICATIONS. BY O. I. BABIKOV. TRANSLATED FROM RUSSIAN. CONSULTANTS BUREAU, NEW YORK. 215 PAGES. \$9.75.

Reviewed by R. M. G. Boucher and A. L. Weiner, College of Engineering, Research Div., New York University.

Essentially, this is a concise treatment of the broad field of ultrasonics, giving the reader a view of the theoretical as well as practical considerations of the phenomena.

Presentation of the theoretical aspects is quite good and probably comprises the best sections of the book. Of particular interest to the reviewers is the discussion of cavitation induced by ultrasonic irradiation.

In general, the author stresses the practical phases of ultrasonics such as nondestructive testing, cleaning and welding. In these areas, he offers relatively little new to the reader and the material is to some extent repetitive.

Very little is included on air-borne ultrasonics or air-borne generators. There is only one sketch of a dynamic generator (siren) and a short section dealing with the gas-driven units. Either the author is not aware of the newer concepts and developments in this phase of ultrasonics or he feels that they occupy a minor role. (If the latter is true, the reviewers take exception to that notion.) There is also a lack of information regarding the use of ultrasonics in the area of chemical processing.

The long list of references (202) is impressive but, unfortunately, most are in Russian and their availability to the American reader might be limited. The many sketches, schematics and photographs are helpful, but there are several better books in this field

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- ☐ 42-20849 Resistance of Aluminum Alloys to Weathering and Resistance of Aluminum Alloys to Chemically Contaminated Atmospheres

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Sales Engineer

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Currently he is a field engineer in the Pacific Northwest area for carbon, graphite, and "Karbate" impervious graphite products.

Mr. Hewitt was graduated from M.I.T. with a B.S. degree in General Engineering.

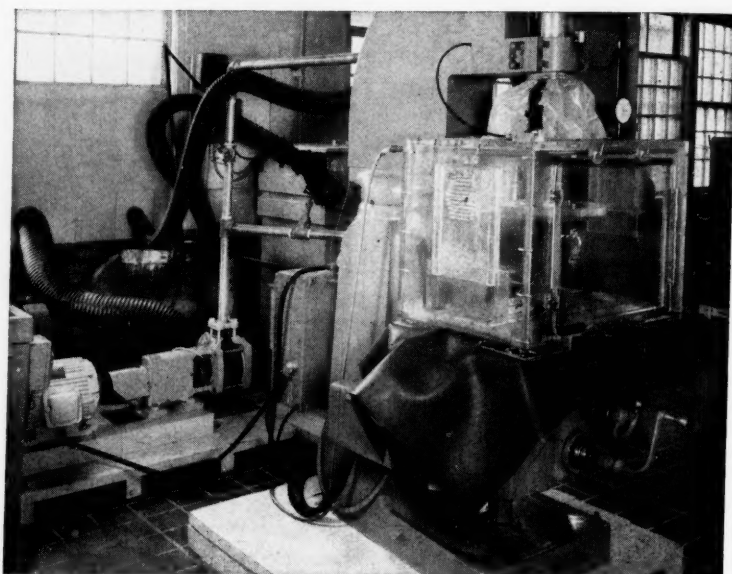
New Frame-mounted Models Expand "Karbate" Pump Line

The frame-mounted Type F pump expands to 32 the number of standard "Karbate" impervious graphite centrifugal pumps now available.

With discharge openings of 1½ and 2 inches, capacities to 140 gpm, and heads to 67 feet, this pump features the same wet end parts and mechanical seal used on "Karbate" motor-mounted models.

For detailed information on the features of "Karbate" centrifugal pumps, write for **Catalog Sections: S-7251, S-7253 and S-7254.**

Same "KARBATE" Pump Handles Wide Variety of Tough Corrosives



Plastic chamber with workpiece, electrodes, and electrolyte. "Karbate" Type F pump at left.

Because of unsurpassed corrosion resistance, "Karbate" impervious graphite centrifugal pumps are being used to handle various chemical solutions used as electrolytes for electroshaping intricate metal parts.

This electrochemical process, developed under sponsorship of Steel Improvement and Forge Company, Cleveland, permits the shaping of jet engine compressor blades in ap-

proximately 1/10 the time required with standard machine tools.

The "Karbate" frame-mounted Type F unit pumps the various types of electrolytes through the electrolytic cell. The pump operates at 3600 rpm, thus providing the high flow rate past the electrodes required to control temperature and maintain proper in-solution metal ion balance.

"Karbate" Pump Gives Trouble-free Service in 0° C. Application

An eastern chemical manufacturer has reported trouble-free operation of a "Karbate" impervious graphite Type F Model FBL centrifugal pump handling an acid solution of aluminum chloride

at 0° C. In ten months of service only periodic seal adjustments have been required. The pump is equipped with the standard carbon-to-carbon rotary seal arrangement.

No other corrosion-resistant material can handle as wide a range of corrosives at temperatures from below zero to 340°F.

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that both the novice and the more sophisticated reader can obtain.

In Rapid Review

Nuclear Reactor Containment Buildings and Pressure Vessels. The Royal College of Science and Technology, Glasgow, Scotland. Butterworths. 572 pages. \$18.50. This record of a symposium held in May 1960 is a highly technical discussion of a very specialized problem, written by and for specialists. Excellent if you design reactor containment structures, but not for the average chemical engineer.

Industrial Organic Nitrogen Compounds. By M. J. Astle. Reinhold. 392 pages. \$14. Covers the industrial high spots of a vast subject in eight chapters with a total of 1,688 references. However, natural products (e.g., alkaloids) are purposely treated lightly, and some newer synthetic ones (e.g., cyanuric acid derivatives) are omitted. This type of coverage makes the volume a handy first stop for the reader with little or no knowledge of a particular product, but he will have to look further for all but the most general information.

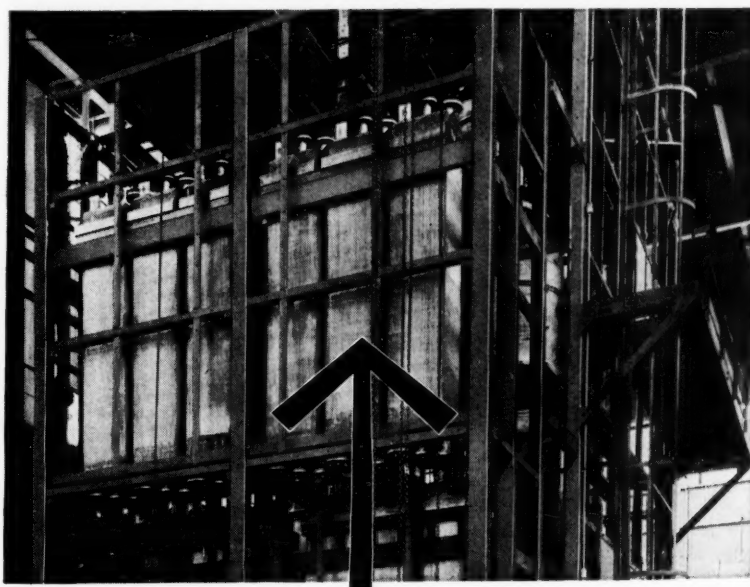
Manual for Plastic Welding: Polyvinyl Chloride. By G. Haim. Chemical Publishing Co., New York. 324 pages. \$15. A remarkably complete handbook on plastic welding, this volume contains considerable information on the manufacture and properties of PVC as well as a detailed description of welding methods and equipment. Descriptions are supplemented by drawings and pictures, some in color. PVC tank linings, pipes and ducts are discussed in detail.

Systematic Layout Planning. By R. Muther. Industrial Education Institute, 221 Columbus St., Boston 16, Mass. 314 pages. \$9.50. Many different duties and skills can be found on the fringes of any profession. The chemical engineers who may be involved in layout and facilities planning can now get tips from a real expert. It's an instruction manual showing a manager or engineer how to come up with the most efficient layout for his situation.

Atomic Energy Waste: Its Nature, Use and Disposal. Ed. by E. Glueckauf. Interscience. 420 pages. \$14. Written by a group of British experts, this text places considerable emphasis on the hazards of nuclear wastes—physical, chemical and biological. The major part is devoted to problems of disposal of both low and high-energy wastes. Also briefly covered are wastes as radiation sources, and uses of radiation in agricultural research, food

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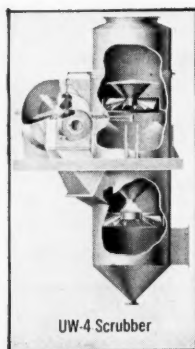
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- ☐ 88-11453 Solving Refinery Corrosion Problems with Aluminum
- ☐ 34-11566 Alcoa Aluminum Heat Exchanger Tubes
- ☐ 88-11251 Cryogenic Applications of Alcoa Aluminum

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preservation and in inducing chemical reactions.

Partition of Cell Particles and Macromolecules. By P.-A. Albertsson. Wiley. 231 pages. \$7. Various procedures are presented in this volume for the concentration and purification of proteins, microsomes, viruses and cells by the use of an aqueous polymer two-phase system. The polymers used include both nonionic polymers and polyelectrolytes. Theoretical and technical aspects of the procedures are described in detail, and data are presented to demonstrate the utility of the methods. The book should be useful to biochemists engaged in the isolation and identification of biological materials.

Modern Chemical Processes. Vol. VI. By the editors of Industrial and Engineering Chemistry. Reinhold. 126 pages. \$6. The sixth volume of I&EC's and Reinhold's joint-effort series, this book presents 17 comprehensive articles that provide coverage-in-depth of a commercial operation at a specific CPI plant. These are reprints of I&EC's staff-industry collaborative reports appearing in issues published during 1958 and 1959. Coverage includes such diverse subjects as chemicals from wood, basic silicone products, pentaerythritol, partially acetylated cotton.

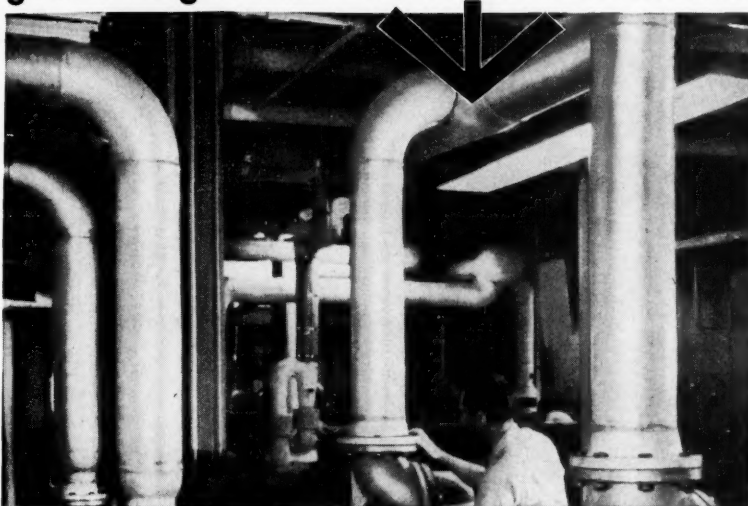
Russian for Scientists. By D. Ward. Macmillan. 204 pages. \$3.95. A quick, straightforward mastery of enough Russian to enable reading technical literature is what this book offers. Author therefore has presented Russian grammar empirically, stressing recognition features that identify the function of a given word within a phrase or sentence. Unavoidably, this approach will cause many tantalizing "Why?"'s to arise in a thoughtful reader's mind. But the book is generally well organized, and the author has done a fine job of blending grammar and vocabulary.

Kinetics and Mechanism. 2nd ed. By A. A. Frost and R. G. Pearson. Wiley. 405 pages. \$11. This second edition of an excellent book reflects the enormous progress made in chemical kinetics in the eight years since the first one came out. Emphasis on the complexities of chemical reactions and the close relation of kinetics to mechanism has been continued and much new material has been added, including a general survey of very rapid chemical reactions.

Heterocyclic Systems with Bridgehead Nitrogen Atoms. Part 1. By W. L. Mosby. Interscience. 747 pages. \$48 (by subscription: \$43). The chemistry

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All-aluminum cooling system reduces danger of water contamination in Brookhaven's new Synchrotron

More than one mile of aluminum piping and some 2,600 FLOWLINE aluminum fittings comprise the magnet cooling system at Brookhaven National Laboratory's new Alternating Gradient Synchrotron. High-purity water at 65°F is circulated through an aluminum piping system to cool electromagnets arranged in a one-half mile long circular ring; the water is then returned to heat exchangers. Because the conductivity of the water must be kept below 11 micromhos, aluminum was selected for its superior resistance to corrosion. View of pump room above shows sections of aluminum piping; FLOWLINE tees, elbows, and reducers, made with ALCOA® Aluminum by Flowline Corp., New Castle, Pa. For more information about aluminum's applications and versatility, please send the coupon.



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- ☐ 68-10460 Process Industries Applications of Alcoa Aluminum
- ☐ 88-11453 Solving Refinery Corrosion Problems with Aluminum

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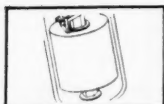
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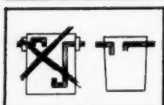


Inside

SUPER-SILVERTOPS



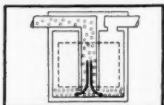
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Silicones. Ed. by S. Fordham. Philosophical Library. 252 pages. \$10. A collection of eleven articles, by British authors, covers various aspects of (1) the chemistry of organosilicon compounds and (2) their industrial manufacture and application. The latter section includes a chapter on present and projected world markets. For chemical engineers needing a quick fill-in on silicones' status, material is pertinent and well organized.

Electronic Packaging with Resins. By Charles Harper. McGraw-Hill. 339 pages. \$11. This book has been written primarily for persons engaged in the engineering and manufacturing of electronic packages who have little or no chemical training. It sets out to acquaint them with the myriad of embedment-packaging materials — polyesters, epoxies, silicones, urethanes, polysulfides—and their chemical nature. Includes lucid explanations of how characteristics of these materials, such as weight, environmental resistance, heat transfer, can be modified for specific purposes.

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Techniques of Plant Maintenance and Engineering. Vol. XII. Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y. 349 pages. \$10. This verbatim report of the Plant Maintenance and Engineering Conference, held in Chicago in January of this year, includes 37 papers, some 600 questions presented by the audience, and the discussions that formed the 11 industrywide problem sessions. Papers and discussions are of a high order. Browsing through them gives a good idea of current trends and developments.

A Guide to Technical Literature Production. By E. Clarke. A "how-to" manual, this 182-page paperback is designed to teach a company the ins and outs of starting up a technical writing department that can turn out brochures, press releases, operating instructions

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Engineering Fundamentals for Professional Engineers' Examinations. By L. M. Polentz. McGraw-Hill. 366 pages. \$9.50.

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Origin of Oil and Oil Deposits. By M. E. Al'tovskii, et al. Translated from Russian. Consultants Bureau. 107 pages. \$17.50.

Handbook of Mechanical Wear. Ed. by C. Lipson and L. V. Colwell. U. of Michigan Press. 469 pages. \$20.

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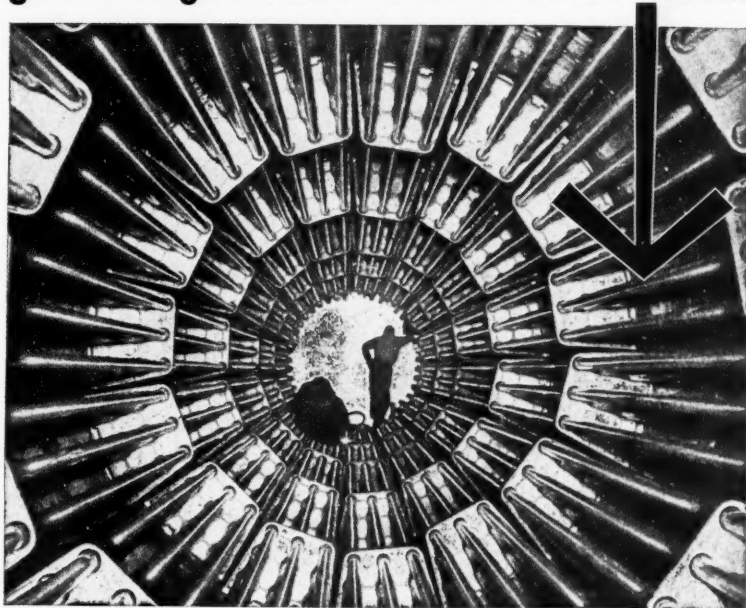
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Proceedings of the International Symposium on Distillation. By various authors. The Institution of Chemical Engineers, 16 Belgrave Square, London. 281 pages. f4 postfree, f3 to members.



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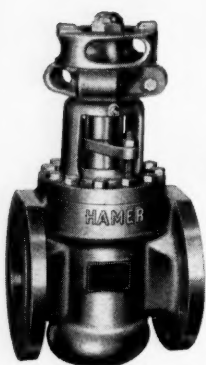
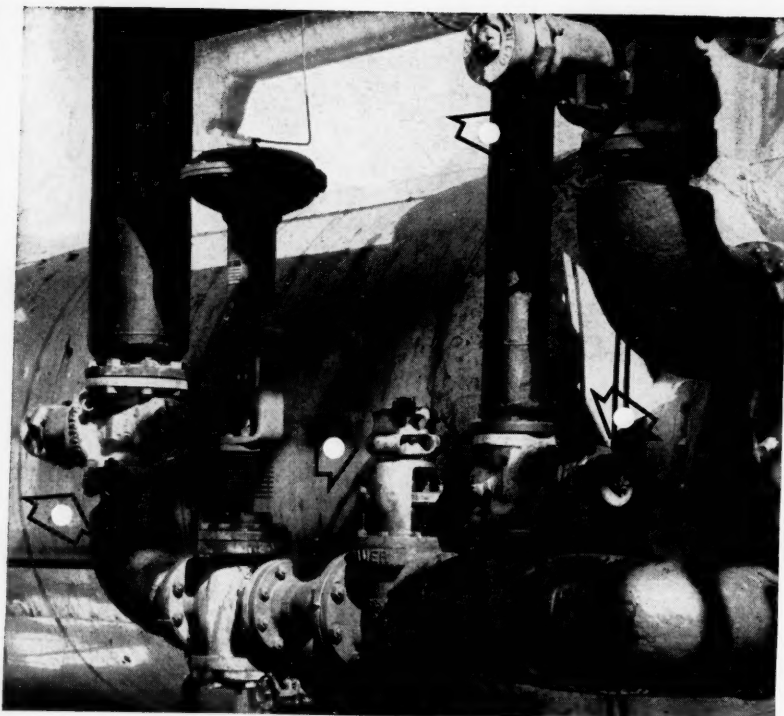


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*Don't forget to check the Free Reprint box for your extra copy of this issue's reprint feature (p. 167)

DUPLICATE BATCHING OPERATIONS



at a touch

WITH THE NEW NIAGARA ELECTRIVOLUME METER

Brings automation to liquid processing. Set the pointer to the quantity of liquid desired and push the button. The meter takes over from there. It automatically measures and delivers the preset quantity, when the flow has stopped it resets the quantity, ready to duplicate the delivery cycle when the starting button is again pressed. It's as simple as that!

To change the quantity for a new formula, just turn the pointer to the gallonage called for and the meter is ready. Should an emergency arise, a stop switch is provided to shut off the flow at any point in the delivery cycle.

The Niagara Electrivolume Meter can be used to start or stop pumps, operate solenoid valves, signalling devices, electric relays and other processing equipment to make the meter the master control center for a complete series of operations. It can be used to actuate other Electrivotume Meters to automatically deliver other liquids in any desired sequence. There is virtually no limit to the extent which the Electrivotume Meter can be used to initiate and control process cycles.

If you formulate liquid components, the Electrivotume Meter will assure complete uniformity of product at lower costs. Write for complete information.

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Sales representatives throughout the nation

Manufacturers' Literature

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Chemicals

Activated Carbons.....A new illustrated booklet provides design data for planning both liquid and vapor phase continuous column adsorption systems.
239 *Pittsburgh Chemical Co.

Aluminum Silicate Pigments.....are mineral products of controlled fine particle size which meet exacting standards. Information is available.
44-45a *Minerals & Chemicals Philipp

Attapulgit Products.....are naturally absorbent, thermally activated crystals in the powder or coarse form. For a variety of applications. Data are available.
44-45c *Minerals & Chemicals Philipp

Bauxite Products.....are thermally treated, high alumina content products in the form of irregularly fragmented particles of controlled mesh sizes.
44-45d *Minerals & Chemicals Philipp

Butyl.....New Butyl HT 10-66 is an isobutylene-isoprene copolymer containing chlorine. Now in full-scale production. Test samples and data are offered.
93 *Enjay Chemical Co.

Butyl Rubber Modifier.....Pronar is a highly-active, non-discoloring, low-cost modifier that makes possible heat treatment of white & light colored butyl.
28-29d *American Cyanamid Co.

Carbon Dioxide.....Around the clock service for delivery of carbon dioxide in any form or in any quantity. An informative booklet is available.
270 *Olin Mathieson

Cellulose.....Cyanocel chemically modified cellulose makes possible lights without heat, glare or moving parts. Further detailed information is available.
28-29b *American Cyanamid Co.

* From advertisement, this issue

Chemicals....Armoflo compounds are described in a new, revised edition of "Armoflo-Armour Anti-dusting & Anti-caking Chemicals" which is available.

*Armour Industrial Chemical Co.
146-147

cis-Butenediol.....Increased demand for this unique intermediate permits a further reduction in price. The new data bulletin is available on request.

113 *Gen. Aniline, Antara Chem. Div.

Coal Tar Chemicals....A folder, Form P.D. 350, includes coal-tar chemicals and petrochemicals. Some are commercially new & other are long established.

101-104 *Allied Chemical, Plastics Div.

Ethylene.....A new, comprehensive brochure covering refined ethylene is available. It contains tables and charts of physical properties and other useful information.

139a *U.S. Industrial Chemicals Co.

Fused Quartz....Vitreosil has extreme heat resistance. Available in many types & sizes. Also fabricated to your special needs. Complete, illustrated catalog.

*Thermal American Fused Quartz Co.
R283

Graphite Anodes.....Technical data sheets are offered containing important information about graphite anode properties. Data on surface finishing are also included.

210 *Great Lakes Carbon Corp.

Hydrofluoric Acid.....Multiple facilities for anhydrous and aqueous hydrofluoric acid. Information and prices are available on this product on request.

65 *Gen. Chem. Div., Allied Chemical

Lime & Limestone Products.....Selected, quality-controlled materials from the finest limestone strata known and graded for many varied uses. Data are available.

44-45e *Minerals & Chemicals Philipp

N-t-Butylacrylamide.....Vinyl monomers copolymerized with N-t-Butylacrylamide can produce polymers which are alcohol soluble. Detailed information is offered.

28-29c *American Cyanamid Co.

Want to build up your files and keep them up-to-date? You can get any publication in this comprehensive guide—free—just for the asking.

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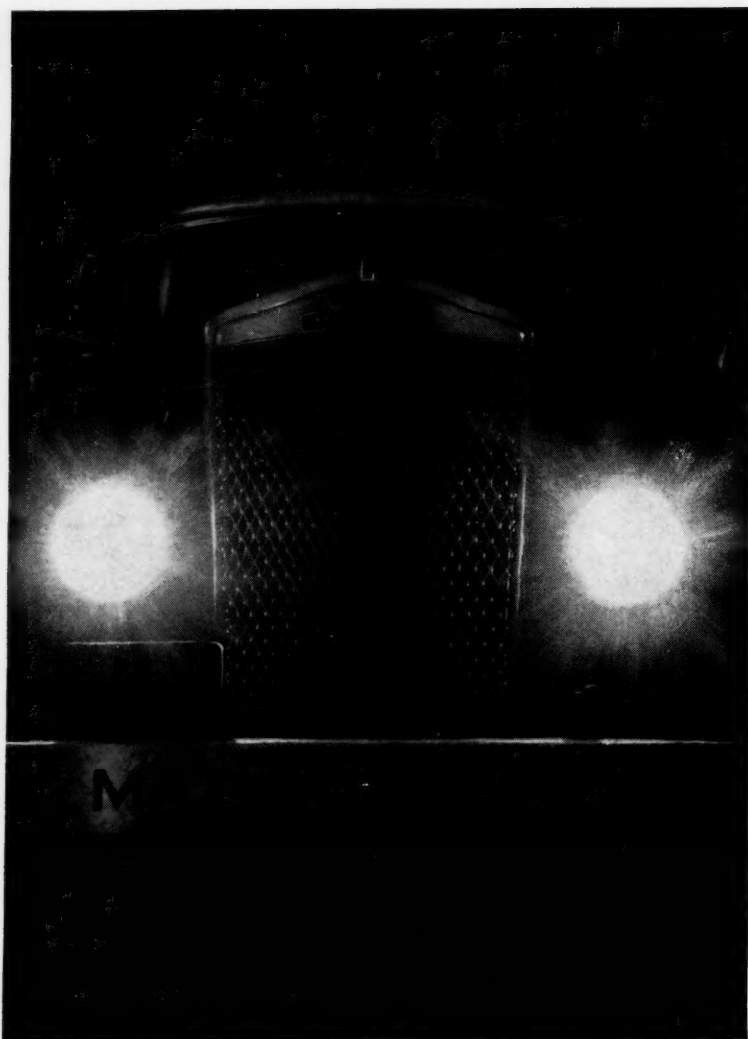
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LITERATURE . . .

Nitrogen Tetroxide . . . is available in tankcars, one-ton cylinders & 150 or 125 pound cylinders. "The Reactions of Nitrogen Tetroxide with Organic Compounds." 219 *Allied Chemical, Nitrogen Div.

Oxygen . . . Tonnage oxygen plants built and operated for your oxygen-nitrogen processes. No capital investment; you pay only for oxygen. Details available. 14-15 *Air Reduction Co.

Phosphorus Oxychloride . . . is an extremely versatile intermediate for developing organic phosphates or plasticizer, gasoline additives or hydraulic fluids. Data sheet. 159c *Hooker Chemical Corp.

Plastic . . . A new brochure giving complete technical data on Kel-F 81 plastic is available. Contains complete laboratory and test data on chemical and physical properties. 134 *Minn. Mining & Mfg. Co.

Plastic . . . Ryertex-Omicron PVC resists 281 corrosive solutions and gases. Features unlimited service life, elimination of costly repairs & downtime. Details are offered. 195 *Joseph T. Ryerson & Son, Inc.

Pseudocumene . . . is now available for immediate delivery. A low-cost, highly reactive, aromatic hydrocarbon which can be readily converted to intermediates. 223 *Enjay Chemical Company

Sodium Borohydride . . . SWS is a stable, aqueous caustic solution of sodium borohydride. It is easy & safe to handle & use in standard equipment. Complete information. 73 *Metal Hydrides Inc.

Sodium Dispersions . . . Dispersed sodium is the key to efficient pilot & plant scale production of sodium borohydride. A 42-page brochure is offered for further information. 139b *U. S. Industrial Chemicals Co.

Solvent . . . Technical bulletins are now available on a variety of Pent-Oxone solvent applications. One deals with vinyl lacquers, one on acrylic formulations, etc. 60 *Shell Chemical Co.

Sulfuryl Chloride . . . is 99% pure. Gives up much less heat during chlorination than elemental chlorine. It has no flash or fire point. Data sheet is offered. 159b *Hooker Chemical Corp.

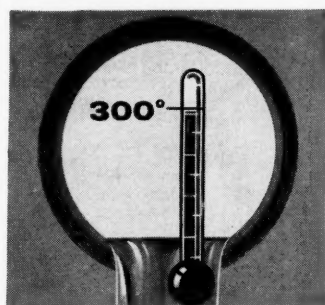
Synthetic Calcium Silicate . . . Micro-Cel absorbs up to 6 times its weight in water. Available in several grades with a wide range of physical properties. 122 *Johns-Manville

Thionyl Chloride . . . can be used to introduce either sulfur or sulfur and oxygen. Makes an excellent chlorinating agent. Data sheet is available on request. 159a *Hooker Chemical Corp.

Construction Materials

Acrylic Fiber Sheet . . . is resistant to, common solvents, most chemicals and ultraviolet light. This material is adaptable to a wide variety of uses. Information. 28-29a *American Cyanamid Co.

*From advertisement, this issue



PROTECTION . . . THAT REALLY WORKS!

If you've ever had a pipe deteriorate, you know how serious it can be. Fibercast stands up where others simply won't do. Produced under a carefully controlled manufacturing process, its solid centrifugally cast walls provide positive protection against high temperatures in corrosive environments.

FIBERCAST® epoxy pipe safely handles corrosive solutions to 300° temperatures

Rugged pipe carries 94% of known corrosive solutions. Available now in sizes from 2" to 8"

Heat and corrosion failures cost money. That's why it's important to consider the maximum protection you get with Fibercast epoxy pipe. Protection against premature fouling, generally attributed to operating temperatures and corrosive solutions. Protection against intermittent replacements, downtime—added costs for new materials and labor.

Years of actual operation in field use, prove Fibercast outlasts other kinds of pipe. Even more expensive metal pipe, or pipe with thermoplastic interior coatings cannot match Fibercast's resin rich interior.

Comparative Life Data

Report after report shows that Fibercast does outperform other types of pipe in terms of long service life. Basing Fibercast Grade J at 100% as unit life, comparable ratings show: Aluminum, 26%. Brass (RED), 74%. Rubber Hose, 21%. Stainless Steel (304-40), 31.1%. Asbestos (cement C-100), 23.7%.

Handles 94% of Known Corrosive Chemical Solutions

Out of 338 common corrosive solutions, Fibercast safely handles 320. Not only does it provide superior resistance to corrosion, heat and pressure—it also has the outstanding ability to maintain the purity of the solutions it carries. The pipe has a glass-smooth interior with a Hazen-Williams C-Flow Factor of 147. This cuts friction losses. Encourages flow at intended pressures. Resists deposit

build-up. Dielectric properties ward off electrolytic action.

Fibercast owes its long life—and its special resistance to heat, pressure, corrosion, contamination, electrolytic action—to the exclusive way it is built. Fibercast is a centrifugally cast thermoset epoxy resin reinforced pipe with multiple layers of seamless braided glass fiber sleeving or especially woven glass fabric. Its body of woven glass fibers, impregnated with epoxy



FIELD USE PROVES RESISTANCE TO CORROSION . . . 1 Plastic-coated steel nipple (right), used in saltwater supply well, corroded and lost strength after 3 months. Fibercast (left), used in same installation for 3 years still shows no loss of strength.

resin chemically cured at elevated temperatures provides remarkable ability to withstand high pressure and temperature in corrosive environments.

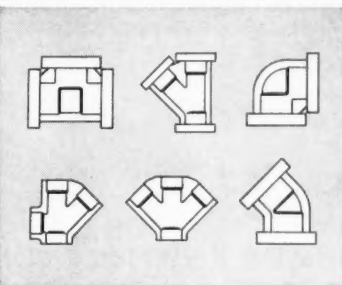
Savings Right from the Start

Fibercast puts you way ahead for your money from time of installation. Light weight makes it easy to handle; (it is

one-fourth the weight of steel). Yet it even has structural stability and strength for installation on span racks with the normal metal pipe spacing.

Complete Line of Fittings

Fibercast offers fittings to solve any fitting problem. Besides a vast stock of standard sizes and types, Fibercast also designs and makes special fitting to meet individual problems. All have the same corrosion resistance properties of Fibercast Pipe and Tubing.



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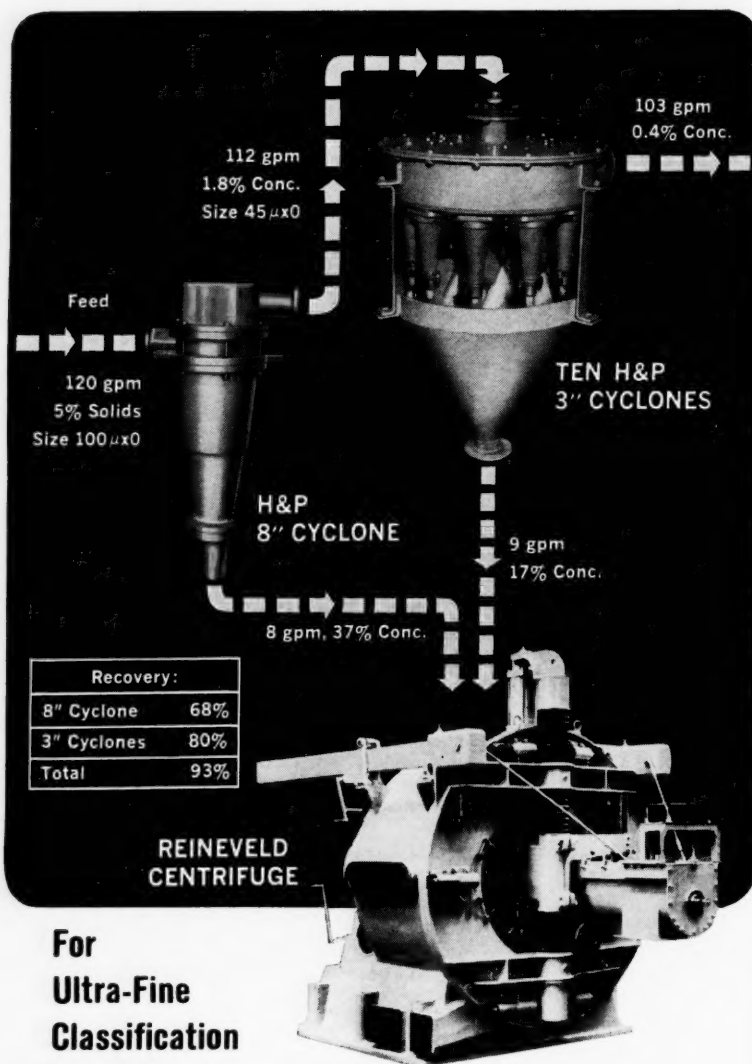
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LITERATURE . . .

Alloys.....for problems from high temp. oxidation, carburization or from corrosion due to nitriding gases or chemicals in flue gases. "Hastelloy Alloy X" booklet. 205 *Haynes Stellite Co.

Alloys.....Spraywelder process of hard surfacing stops excessive corrosion and abrasion. For further information on this hard-surfacing alloy, the Spraywelder Catalog is offered. BR288 *Wall Colmonoy Corp.

Aluminum.....A booklet entitled, "Process Industries Applications of Alcoa Aluminum" is available for information on the wide variety of applications of aluminum. 261c *Aluminum Co. of America

Aluminum.....Literature has been prepared to help in solving refinery corrosion problems through the use of aluminum and may be obtained upon request. No. 88-11453. 261d *Aluminum Co. of America

Coating.....Carbo Zinc 11 is an inorganic zinc-filled coating which gives protection similar to galvanizing. Complete details are available on request. 216 *Carboline Company

Coating.....No matter what the size or shapes of your product, it can be coated better with Kanigen nickel alloy. Detailed information in Bulletin 561. 150 *General American Transportation

Coating Clay.....Spray-dried Kaolins offer high-purity and high-uniformity. Used for coating paper but are applicable to other applications. Information. 44-45b *Minerals & Chemicals Philipp

Coatings.....Syl-off coatings have natural nonoil lubricity & water repellency . . . won't migrate, contaminate or transfer. Descriptive brochure offered. 132 *Dow Corning Corp.

Coatings & Enamels.....Imlar vinyl-mastic coatings & vinyl enamels have been developed for use where metal protective finishes are not recommended. Bulletin. 24 *E. I. DuPont de Nemours

Construction Material.....Information is available on request concerning Koroseal, the flexible material that can withstand practically all acids. 1 *B. F. Goodrich Industrial Prod.

Fabrication.....from assignments of towering proportions to smaller jobs of the most intricate design. A resume of Boardman capabilities is available on request. 55 *The Boardman Co.

Filter Fabrics.....The handy informative booklet, "Filter Fabric Facts" contains distributors names and answers problems related to your selection of filter fabrics. 214 *Wellington Sears Co.

Filter Paper.....custom-tailored to your process & your press. A 24-page catalog on industrial filter papers gives complete details. Catalog 357. 52 *Eaton-Dikeman Co.

Gasket Material.....Booklet describes "Armalon felts" & includes data on characteristics, detailed list of specific applications & information on sizes & thicknesses. 211 *E. I. DuPont de Nemours

*From advertisement, this issue

BENZENE:

Shell increases benzene capacity 500 per cent. Can now fill orders anywhere from 3 refineries. Mammoth storage system can make benzene available on a local basis.

Shell now has the largest benzene-producing capacity in the world. It exceeds 80 million gallons a year. An increase of nearly 500 per cent in less than 18 months.

Shell benzene now comes from 3 refineries. You can take delivery by barge, truck or tank car—depending on your location.

You can get all the benzene you need, when you need it. Read the facts below.

THE DEMAND for benzene has soared. New uses are coming along every year. Shell has answered the need with a massive increase in capacity.

Bigger supplies now

Shell's annual benzene production capacity tops 80 million gallons of high purity product. *Production and distribution facilities are nationwide.*

Three Shell refineries can now produce benzene: Wood River, Illinois; Houston, Texas; and Wilmington, California.

Shipments come by barge, tanker, tank car or truck

All three are located near waterways to make possible direct barge or tanker shipments—a great potential saving. Shipment can also be made by tank car or transport truck.



Shell's production and storage points are strategically located to facilitate supply of high purity benzene (see map above). All Shell's benzene-producing refineries are on major waterways. Inland locations make possible delivery by tank car, truck or barge.

Wherever the demand justifies, Shell's enormous nationwide storage facilities (see map) can be used for benzene. Strategically located across the country, these facilities make Shell benzene potentially available on a local basis.

Shell benzene is Thiophene-free

Manufacturers choose Shell benzene when quality must be consistently high. It is Thiophene-free.

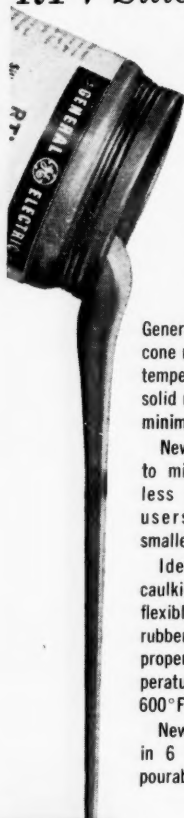
For full facts about Shell benzene, contact your Shell Industrial Products Representative. Or write: Shell Oil

Company, 50 West 50th Street, New York 20, New York.



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IN
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SIZE!**

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Detroit

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15605 Woodrow Wilson

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572 Communipaw Ave.

Floral Park, Long Island, N. Y.

Punt, Incorporated
160 Woodbine Ct.

Philadelphia

Smith of Philadelphia
1024 Race St.

Chagrin Falls, Ohio

Electrolock, Inc.
28 North Main St.

or write: General Electric Company, Silicone Products Dept., Section GG958, Waterford, N. Y.

GENERAL ELECTRIC

LITERATURE . . .

Gaskets . . . Spiral-Wound gaskets for critical sealing applications using the proper metal, filler & yield characteristics for the specific job.
127 *Flexitallic Gasket Co.

Gaskets, Teflon-Jacketed . . . Wide variations of styles, filler materials and sizes can be furnished to suit practically all process equipment.
Cat. AD-154.
108 *Garlock, Ind.

Insulating Firebrick . . . feature long life, high hot load strength and low heat flow. Complete data are to be found in Bulletin R-38 which is available on request.
130 *The Babcock & Wilcox Co.

Insulation . . . Foamglas insulation is a cellular glass insulation. The Industrial Insulation Catalog contains details and is available on request.
71 *Pittsburgh Corning Corp.

Packings . . . Big 7 packings reduce downtime, lower inventory and simplify ordering. The Big 7 Packing Selection Chart is a handy guide and is available on request.
302 *Raybestos-Manhattan, Inc.

Plastic Fabrications . . . Even the largest corrosion problems are routine with reinforced plastic construction. Bulletin 103 is available for details.
228 *DuVerre, Inc.

Plastic Tape . . . Rulon tape in thicknesses from .004" to .125". Features low friction, high wear resistance, low deformation under load and other qualities.
L285 *Dixon Corp.

Refractories . . . A complete series of gunning, ramming and casting refractories is available to meet every furnace operating condition and temperature requirement.
*Harbison-Walker Refractories Co.
157-158

Silicone Rubber . . . RTV silicone rubber is now available in 1 lb. jars to mix small batches. Cures at room temperature to form a flexible solid. Information.
L274 *General Electric Co.

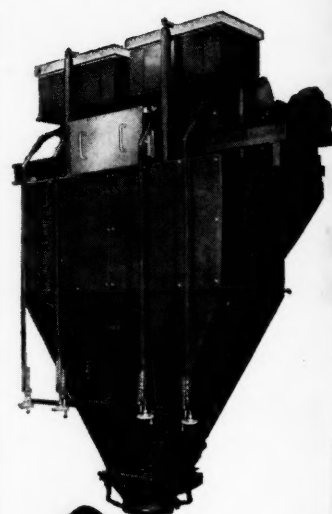
Wire Cloth . . . A new data file designed in loose leaf form for your convenience contains a full range of specifications from the finest to the coarsest meshes.
256 *Cleveland Wire Cloth Co.

Electrical & Mechanical

Air Motors . . . Variable speed, explosion-proof air motors can't burn out from overloads. Vanes take up their own wear. Top quality ball-bearing design. Bulletins.
TL301 *Gast Manufacturing Corp.

Couplings . . . for every operation that calls for quick, tight connections. Available in brass, malleable, stainless, aluminum, etc. Details in illustrated Catalog C-11.
75 *Ever-Tite Coupling Co., Inc.

Electrical Systems . . . Integrated, automated systems that eliminate loss, manpower waste & excess materials handling costs. Bulletin 2900 is available for details.
112 *The Louis Allis Co.



One

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PULLS
LARGE FEED MILL
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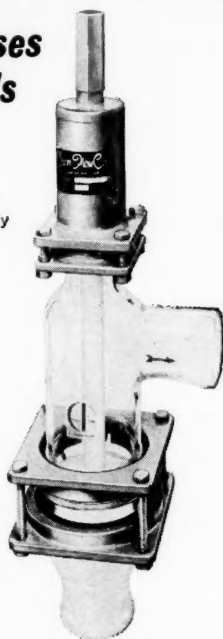
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seat

High heat
resistance



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construction

Patented
lip seal

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rate

Low pressure
drop

Model R check valves operate in both vertical and horizontal position and give complete visibility and excellent corrosion resistance to all liquids except hydrofluoric acid and hot concentrated caustics. Available in sizes 1", 1½", 2" and 3"; adaptable to any pipe installation with 150 lb. ASA companion flange.

*T.M. Corning Glass Works

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LITERATURE . . .

Motors......Silicone rubber insulated motors are exceptionally moisture-resistant. They have more overload capacity for temporary overloads & reduce downtime.
144 *Wagner Electric Co.

Motors, Corrosion-proof......eliminate rusting motor problems. Bulletin B-2406 is available. Gives complete information on 1 to 125 up motors.
51 *Reliance Electric & Engr. Co.

Rectifiers......as well as complete semi-conductor power conversion equipment and systems for any AC to DC application. "Guide" to Industrial Rectifier Equipment.
123 *The Meaker Co.

Rupture Discs......Model CPV is designed for low pressure application while Model HOV is designed to operate closer to rupture pressure. A catalog is available.
R222 *Fike Metal Products Corp.

Starters......Information about the new line of across-the-line starters is contained in the new Publication 6100 which is available on request. All in smart new enclosures.
229-230 *Allen-Bradley Co.

Switches......Visible blade construction of these switches insures safety. Handle designed as an integral part of the switch adds extra safety.
307 *Square D Company

Thermocouple Assemblies......More than 100 complete assemblies in a wide range to cover most applications in any industry. Details are available in Catalog G100-1.
R282 *Minneapolis-Honeywell

Turbines......Type YR turbines are tightly sealed against heat, cold, dust, fumes, rain & snow. Many key parts are interchangeable for various frame sizes. Bul. H22-D.
40-41 *Elliott Co.

Turbines, Solid-Wheel......requires minimum maintenance. A new book, Bulletin S-159 discusses in detail the design and performance of this solid-wheel turbine.
114 *Terry Steam Turbine Co.

Handling & Packaging

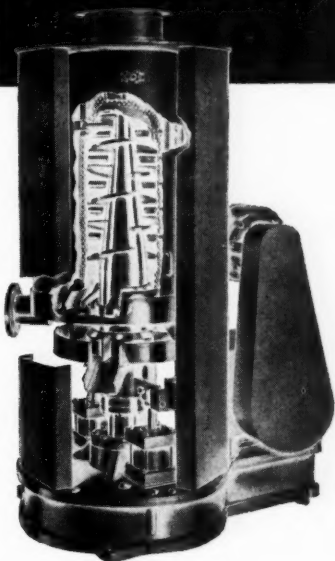
Automatic Scales......Technical bulletin on how automatic bagging and proportioning scales are promoting good housekeeping, controlling quality, etc.
298 *Richardson Scale Co.

Batching & Weighing......New Batchtron uses high-speed electronic methods to weigh & batch a number of liquids & solids by means of manual or punched card control.
149 *Fairbanks, Morse & Co.

Belt Conveyors......for small or large tonnages, for route of any length. Pre-Bilt sectional belt conveyors are also available. Catalog is offered.
10-11b Link-Belt Company

Bucket Elevators......Complete line includes 14 types in 4 basic designs . . . centrifugal, positive, continuous, & internal discharge. Factory-aligned components available.
10-11c *Link-Belt Co.

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IT'S CONTINUOUS—completely automatic . . . self-adjusting . . . no operator.

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IT'S ECONOMICAL—greater production . . . lower horsepower . . . better product . . . near zero maintenance.

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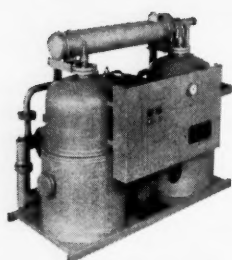
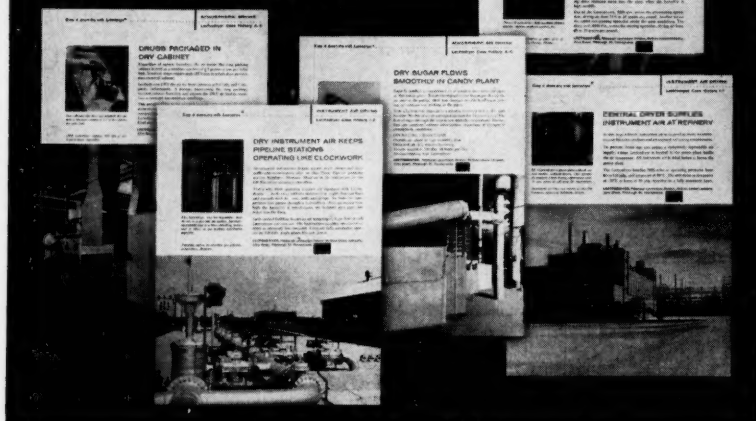
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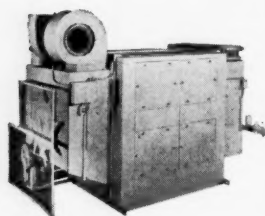
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ZENITH PRESS DIVISION

* From advertisement, this issue

Stories with happy endings to moisture problems...



Type BZ—Dual-adsorber, pressure-reactivated unit. Fully automatic. Designed for drying compressed air for instrument line service and for many other applications.

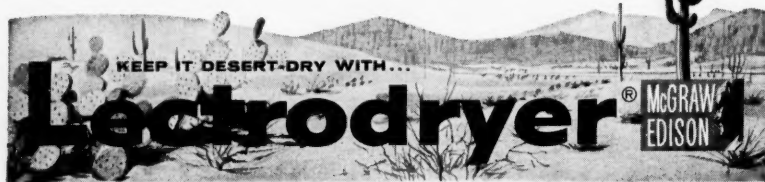


Type CH—Multi-adsorber, heated-air-reactivated unit. Fully automatic. Designed for air conditioning service.

These engineering reports on problems solved by Lectrodryers may contain the answer to your troubles with unwanted moisture. The plot's the same in each—with moisture serving as the villain in clogging instrument air lines, interfering with packaging of drugs, speeding up corrosion, or committing other costly crimes.

Lectrodryers solved these problems. Air, dried to a very low dewpoint now keeps operations on the straight and narrow path, or protects equipment and stocks. Each case history cites difficulties encountered, names conditions and describes the equipment that solved it.

For copies of these reports, or for other drying help, write Pittsburgh Lectrodryer Division, McGraw-Edison Company, 303 32nd Street, Pittsburgh 30, Pennsylvania.



LITERATURE . . .

Bulk-Flo System.....One unit combines a feeder, elevator and conveyor. Operates horizontally, inclined or vertically. A catalog is offered.
10-11d *Link-Belt Co.

Bulk Handling System.....with the efficiency and economy of automation and the flexibility and versatility of unit containers. New booklet gives details.
32-33 *Tote Systems, Inc.

Bulk Storage.....A bulletin is offered giving detailed information on storage tanks for specially denatured alcohol or proprietary solvents. Includes diagrams of tanks.
139c *U. S. Industrial Chemicals Co.

Lift Trucks.....feature Power-Crater engine with 6 cylinders. New F Series lift trucks are described in Bulletin BU-680 which may be had upon request.
87 *Allis-Chalmers

Loader.....Loads can be palletized or stacked in any pattern, also put into warehouse storage. Literature & engineering details are available.
TL287 *Power-Curve Conveyor Co.

Oscillating conveyors.....All four types of oscillating conveyors provide surge-free movement of materials. Catalogs are available on request.
10-11e *Link-Belt Co.

Scales.....Have no knife edge pivots to wear and cause inaccurate weighing. Recommendations on improving or maintaining your competitive position are offered.
R274 *Thayer Scale Corp.

Scales, Industrial.....When you have a problem in weighing, testing, counting, batching, sorting or weight data processing. Information is available.
280a *Toledo Scale Corp.

Screw Conveyors.....are easily adapted to congested locations & operate horizontally, vertically or inclined. Catalog is available for details.
10-11a *Link-Belt Co.

Steel Tanks.....Rubber-lined steel tanks and special equipment along with custom compounds for field application are described in Bulletin CE-53.
191b *American Hard Rubber Co.

Tractor Shovels.....Michigan Tractor Shovels are available in a wide variety of models for excellent performance and economy. Further information is available.
136 *Clark Equipment Co.

Heating & Cooling

Burner Units.....These gas firing burner units can be supplied with a medium pressure gas pilot for electric ignition. Literature & technical & engineering data offered.
120 *National Airoil Burner Co.

Heat Exchanger.....A great range of sizes are available with pressures up to 50,000 psi. These heat exchangers may be fabricated from almost any metal to suit your needs.
67 *Graham Mfg. Co., Inc.

*From advertisement, this issue

LITERATURE . . .

Heat Exchangers.....return 30% on investment. An important study, "New Economies in Cooling Chlorine" is available and may be had upon request.
48-49 *Titanium Metals Corp.

Heaters.....Hi-Turbiant heaters heat direct-fired process streams & heating transfer fluids fast & economically. Literature may be had upon request.
BL301 *Western Precipitation

Heating Equipment.....Electrically heated jackets, kettles and industrial equipment are described in detail in Bulletin J-1 which is available.
BR303 *Trent, Inc.

Heating Products.....Catalog 956 covers Grid unit heaters, blast heater, and radiators. Designed for operation on steam pressure up to 250 PSI 450 degree temperature.
125 *D. J. Murray Mfg. Co.

Organic Liquid Heaters.....can be modified to meet a wide range of job requirements. They can be arranged for firing with most commercial fuels. Information.
141 *Union Iron Works

Steam Trap.....Model N-150 thermostatic steam trap features all steel construction with just one working part. It is freeze-proof when installed vertically.
249 *W. H. Nicholson & Co.

Steam Traps.....The 48-page book gives complete information and details on steam traps. Also information on design, construction and operation of Inverted Bucket Trap.
152 *Armstrong Machine Works

Steam-Traps.....Silvertop steam traps feature a guided bucket, no restricted passages and reverse flow. Details are contained in Bulletin 26 which is offered.
262 *The V. D. Anderson Co.

Steam Traps.....Type TD-50 can be used to control moisture content automatically. Other advantages include simplified piping, saved space, easy maintenance. Information.
251 *Sarco Company, Inc.

Steam Traps.....Series 60 Impulse steam traps are designed with high production in mind. The latest steam trap Bulletin T-1743 is available on request.
227 *Yarnall-Waring Company

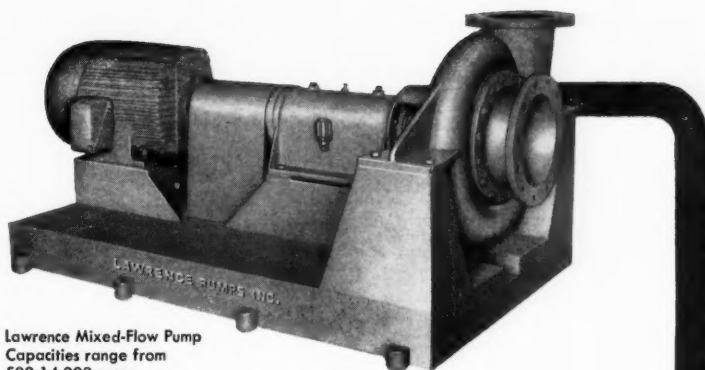
Instruments & Controls

Analog Computing Systems.....are available in both pneumatic and electronic units. Offer continuous calculation of all the arithmetic functions in any combination.
12-13 *The Foxboro Company

Chlorinator.....V-notch chlorinators provide the economical answer to water- and waste-treatment problems. More information is available on request.
244 *Wallace & Tiernan, Inc.

Combustible Gas Alarm.....Explosi-arm is a small, completely self-contained combustible gas alarm that features low cost and low maintenance. Bulletin is offered.
133 *Mine Safety Appliances Co.

*From advertisement, this issue



Lawrence Mixed-Flow Pump
Capacities range from
500-14,000 gpm.

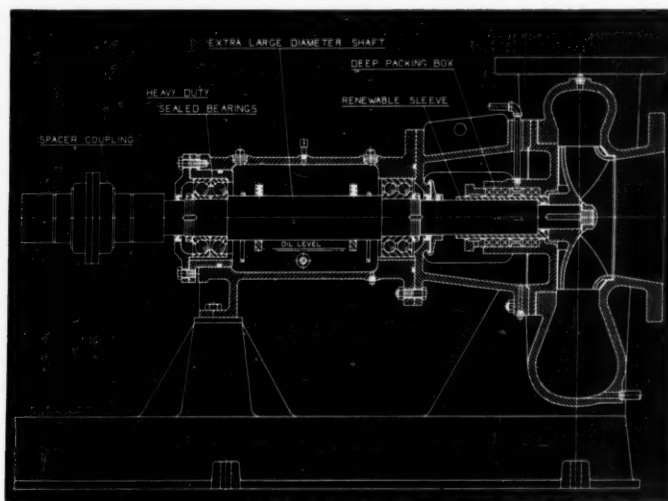
MIXED-FLOW PUMPS

When your requirements call for a large capacity, medium head pump, you'll find it pays to look to Lawrence for a Mixed-Flow pump custom built to your needs.

For this kind of application, Lawrence Mixed-Flow pumps are more efficient and less expensive than other types of pumps. First cost is low. Their high mechanical efficiency, combined with non-overload characteristics add up to additional important savings in power and operating costs.

Lawrence offers a complete line of Mixed-Flow pumps from 6" to 16", for capacities ranging from 500 to 14,000 gpm. We supply them in all corrosion-resistant metals, including cast iron, carbon steel, bronze, stainless steel, monel metal, nickel, or Hastelloy.

For complete information, send for Bulletin 211-1.



Cross section of Lawrence Mixed-Flow Pump

LAWRENCE PUMPS INC.

371 Market Street, Lawrence, Mass.



CRYOGENICS

Helium

Refrigerators 4°-20°K Recovery-Purifier Plants Liquid Storage and Transport Cryostats

Helium is one of the most valuable, most inert and most difficult gases to handle en masse in liquid state. One of Cryenco's special interests is designing and building custom helium equipment. Cryenco has designed refrigerators for the temperature range of 4°-20°K with small and large capacities. One of Cryenco's recovery-purifier plants produces Grade A helium at a rate of over 100 SCFM. Cryenco's efficient helium dewars and tanks range from 100 liters to 7000 gallons. Special 4° cryostats are also available. Let Cryenco handle your helium problems and free your physicists and engineers for fundamental work. Write for quotation on your specific requirement.

CRYENCO

Cryogenic Engineering Co.
215 W. 48th Ave., Denver 16, Colo.
Low Temperature, High Vacuum
Equipment and Engineering

LITERATURE . . .

Comparator.....Handbook, "Modern pH & Chlorine Control" gives theory and application of pH control. Illustrates and describes full line. Available on request.
R284 *W. A. Taylor & Co.

Computer.....Recomp 111 is the newest low-cost compact digital computer. Full information is available on its proven performance and quality.
226 *Autonetics Div. of N. American

Computer.....Dataplotter 3300 reduces digital information to Cartesian coordinates in X and Y, in point or line, on paper up to 30x30 in. Information is offered.
240 *Electronic Associates, Inc.

Controller.....Multi-Point controller controls ten process temperatures. Critical circuitry is fused against overloading. Maintenance is easy. Instrument Sec. 52-4 offered.
27 *Thermo Electric Co.

Controls.....to control or indicate the pressure or temperature of gases, fluids or electrical energy. A wide variety of instruments such as transducers, etc.
77 *American-Standard

Controls....Radionic control by radiation is described in Bulletin 558 which is available while control by capacitance is described in the Electr-O-Probes Bulletin B-07.
BL305 *Instruments, Inc.

Dial Indicator.....Six-inch dial indicator gives easy, accurate readings at point of measurement. Designed specifically for field indication. Specification S224-1.
36-37f *Minneapolis-Honeywell

Electric Transmitter.....Bellows flow meter can be used as an electric transmitter with indicators, recorders & controllers. Specification FS 301-7 is offered.
36-37e *Minneapolis-Honeywell

Feeder.....Merchen feeder gives you greater feeding accuracy because of its sensitivity. It is compact & gives you hour-to-hour accuracy for feeding & blending. Inform.
245 *Wallace & Tiernan, Inc.

Flow Meter....A low cost, lightweight, versatile flow meter to beat the corrosive liquid metering problem. Further detailed information is contained in booklet.
L284 *B-I-F Industries

Gauges.....Dial-type gauges show tank contents at-a-glance. Available to measure and indicate virtually any liquid at tank site or remotely. Literature.
286 *The Liquidometer Corp.

Gauges....The unique Maxisafe Dura-gauge provides absolute protection to the viewer plus easy & quick access to the mechanism. Catalog 300B.
126 *Manning, Maxwell & Moore

Indicating Pneumatic Transmitter.... A Bellows flow meter may be used to give indication at the point of measurement plus pneumatic transmission. Specification S230-1.
36-37e *Minneapolis-Honeywell

Level Switches.....designed for open or pressurized systems. Feature extreme resistance to demagnetization and multiple switching functions. New folder RC-765 is offered.
236 *Robertshaw-Fulton Controls

* From advertisement, this issue

Handle Flammables SAFELY with Protectoseal PRODUCTS



**STAINLESS
DRUM FAUCETS**

For 30 and 55 gal. drums. Self-positioning or rigid spouts. Self-closing. Stainless steel body. Teflon O-Ring Seal.

**DRUM
TRANSFER
PUMP**

For quick, safe dispensing from drums. Pumps up to 5 gpm. Optional cut-off control eliminates overflow, spillage. 3 built-in fire baffles protect drum contents from exterior ignition source.



**OVAL SHAPE
SAFETY CANS**



Oval storage or dispensing can save space. Available in stainless steel, terne plate or hot dipped. Safe, quick, filling or dispensing. Double wall fire baffles. Leather or Teflon gaskets.

**FLAMMABLE
STORAGE
CABINET**

Provides safe, convenient storage of flammable liquid safety cans at point of use. Removable, adjustable shelves. 45"x65"x18".



**IN-LINE
FLAME
ARRESTER
VENTS**

Prevent flash-backs into tanks, process kettles etc. through vent opening. Complete, self-contained unit design simplifies inspection and maintenance. For 1", 2", 3" and 4" pipe. Write for Protectoseal Vent Catalog. Describes complete line of tank vents, fittings, accessories.

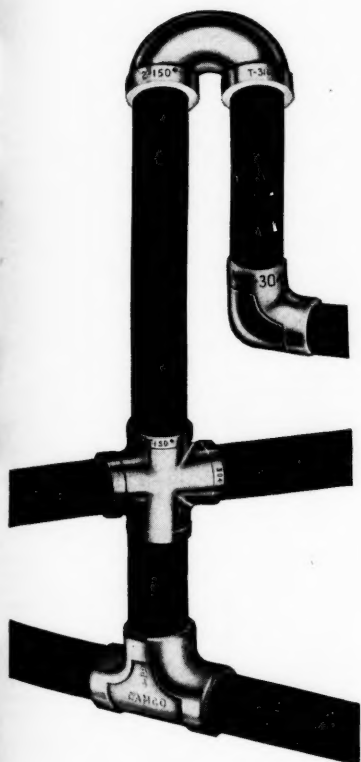
Write for the new Protectoseal RED BOOK. Contains flammables engineering fundamentals and complete line of safety containers and operating equipment.



**THE
PROTECTOSEAL
COMPANY**

1948 S. WESTERN AVE. • CHICAGO 11, ILL.

**The most
Dependable
Source for
Stainless
Steel and
Forged Steel
Fittings**



CAMCO

Screw & Socketweld FITTINGS

• 150 Lb. through 6000 Lb. Stainless Steel Screwed and Socketweld Fittings • 2000 Lb. through 6000 Lb. Forged Steel Screwed and Socketweld Fittings • Extra Heavy Stainless and Forged Steel Unions • Light Weight Forged Steel Back-Up Flanges for use with Schedules 5 and 10 Stainless Piping.

CAMCO FITTINGS, INC.
301 State St., No. Haven, Conn.

Send for Complete Catalog
and NEW Price List



LITERATURE . . .

Liquid Level Control.....The operating principle of Magnetrol is based on the proper use of a permanent magnet. Further information is available on request.
TR288 *Magnetrol, Inc.

Meters.....New Electrivolume meters bring automation to liquid processing. Can be used to start pumps, operate solenoid valves, signalling devices, etc. Information.
268 *Buffalo Meter Co., Inc.

Non-Indicating Transmitter.....for use when you don't need indication at the point of measurement. A copy of Specification S230-1 is available on request.
36-37d *Minneapolis-Honeywell

Pressure Gauges.....for chemical plants and refineries. Feature thru vision and reflex single or multiple sections. Glass is completely enclosed.
L222 *Strahman Valves, Inc.

Receiver.....New Series 670 Metagraphic receivers measure only 7" wide by 7 1/4" high on panel and come in a wide selection of models. Complete data are available.
128 *The Bristol Company

Recorder & Integrator.....The Bellows flow meter may be used as a recorder or integrator. Specification S 292-2a is available on request for details.
36-37a *Minneapolis-Honeywell

Recording Controller.....Specification S292-2a is available to show how to use the Bellows flow meter as a recording controller with pneumatic On-Off.
36-37b *Minneapolis-Honeywell

Regulator.....The 680 Series regulator is a highly stable single stage regulator with control accuracy at 2% at flows to 2000 SCFH. Information is offered.
105a *Hoke, Inc.

Regulator.....The 640 Series regulator is built specially for corrosive gases and atmospheres. In monel or all stainless steel construction. Information is offered.
105b *Hoke, Inc.

Regulator.....The 920 Series regulator will handle delivery pressures up to 4500 psi with very high control accuracy. Further information is available.
105c *Hoke, Inc.

Temperature Regulator..... available in sizes 1/2" to 4". Temperature ranges as low as 15 F. to 50 F.—as high as 240 F. to 350 F. Information in Bulletin 114A.

17 *Manning, Maxwell & Moore, Inc.

Transmitter.....The new f/b Line transmitter is available in a wide selection of ranges. Measures & transmits a linear signal of true flow. Data available.
118 *Bailey Meter Company

Pipe, Fittings & Valves

Aluminum Pipe & Fittings.....A booklet describing aluminum pipe and fittings and their various applications and dimensions is available on request.
261a *Aluminum Co. of America

* From advertisement, this issue



*solution metering pump...
with high repeatability,
pre-calibrated accuracy,
corrosion resistance
in four ml/min. ranges*

Now add liquids with precision! The new Beckman pump assures repeatability to better than $\pm 0.5\%$ of rated capacity. A simple dial setting controls flow accurate to $\pm 2\%$ of pump's full range. Unit disassembles in two minutes for cleaning or sterilization. Highly inert internal components prevent contamination of pumped fluids and permit handling of highly corrosive materials. Mechanically actuated valves assure leak-free performance at low pressures. The Solution Metering Pump, available in 0-2, 0-5, 0-10, and 0-20 ML/MIN. ranges, is ideally suited for reaction rate studies, drug infusion in animals, pilot plant work, reagent addition, and many other laboratory and process plant applications. For additional information, contact your Beckman laboratory apparatus dealer or write for Data File 14-38-09.

Beckman

INSTRUMENTS, INC.

SCIENTIFIC AND PROCESS
INSTRUMENTS DIVISION
Fullerton, California

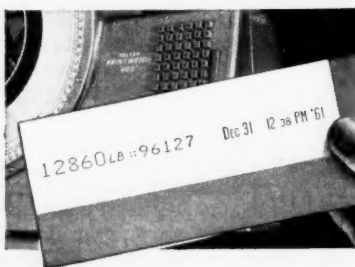


Why you should think of your scales as MONEY WEIGHING MACHINES

Cold, hard cash is the final value yardstick you must apply to every material or product that moves into, through, or out of your plant. How much does it cost? How much does it save? How much profit does it produce? In the last analysis, the answer always comes up in dollars and cents.

With dollars at stake, the *right* Toledo Scale at each weighing point is of the *utmost importance*... the backbone of control your needs demand. Your Toledo representative will take a personal interest in helping you get all the benefits provided by advanced Toledo methods and equipment. Write today. Toledo Scale, Division of Toledo Scale Corporation, Toledo 12, Ohio. (Toledo Scale Company of Canada, Ltd., Windsor, Ontario.)

TOLEDO PRINTWEIGH® "400"
provides complete printed weight records



Prints where you wish on full 8½" x 11" forms, or on tickets or strips. Prints full figures, even when unit weights are used. Positive weight identification, with selective numbering, weight symbols, or consecutive numbering. Also prints time and date, if required. Weight data may be transmitted electrically to remote adding or other office machines. Ask for Bulletin 2017.



SERVICE
Factory-Trained
240 Cities

TOLEDO

Headquarters for Weighing Systems

LITERATURE . . .

Ball Valve.....The Econ-O-Miser is available in sizes from ¼" to 6" and is ideally suited to difficult media because of its smooth round flow & leakproof shut-off.
121 *Worcester Valve Co., Inc.

Ball Valves.....feature compact design, rotating seats to distribute wear, no bonnets or glands and they are sealed-for-life. Available in a wide range of sizes & pressures.
129 *Cameron Iron Works, Inc.

Butterfly Valves.....Resilient seated butterfly valves save space, save weight, save cost and save trouble. Control may be manual or automatic. Bulletin 590X.
R301 *W. S. Rockwell Co.

Control Valve.....The new Series 1400 low flow control valve is available in a full range of materials, ratings and sizes. Complete details are in Bulletin B803-1.
95 *Minneapolis-Honeywell

Fittings.....Screwed and Socketweld fittings in sizes 150 lb. through 6000 lb. stainless steel and 2000 lb. through 6000 lb. forged steel. A complete catalog and new price list.
L279 *Camco Fittings, Inc.

Fittings.....made from either seamless tubing or rolled plate. The story on these quality fittings is contained in Bulletin 60C which is available on request.
83 *Midwest Piping

Gate Valves.....Hard rubber-lined gate valves give full protection at reasonable cost. Can be packed while open at full pressure. Details in Bulletin CE-51/52.
191a *American Hard Rubber Co.

Gate Valves.....Cast steel gate valves are made in regular and special compositions to match exact operating conditions. More detailed information is available.
142 *Darling Valve & Mfg. Co.

Gate Valves, Stainless Steel.....Detailed information is available on the new 300 and 600 pound stainless steel gate valves featuring free-rotating split-wedge disc.
212 *Crane Co.

Globe Valve.....Bubble-tight bronze globe valve with dual sealing is the newest concept in valve design. A descriptive bulletin is available for further information.
22-23 *Walworth Co.

Heat Exchanger Tube.....in carbon steel or stainless steel for dependability and reliable performance. Further information on this product and its capabilities.
238 *Standard Tube Co.

Heat Exchanger Tube.....Trufin type S/T tube helps shrink plant costs & boost production. A copy of Trufin Comparison Costs Book is available on request.
137-138 *Wolverine Tube Div., Calumet & Hecla

Heat Exchanger Tubing.....Lectro-sonic is a welded tube with a new concept of quality, designed specifically for economical long life in heat exchangers. Bul. TB-431.
96 *The Babcock & Wilcox Co.

Heater Tube.....New Feedwater heater tube provides high strength at lower cost. A 44-page Publication B-2 and Cupro Nickel, 30%-707 Publication B-45 are offered.
107 *Anaconda American Brass Co.

*From advertisement, this issue

LITERATURE . . .

Jacketed Pipe & Fittings.....Special jigs insure uniformity of the jacketed area. Fittings & valves in cast or welded construction. Details in Bulletin J-57.
BR306 *Hetherington & Berner

Pipe & Fittings.....Hard rubber pipe and fittings, including heat resistant Tempron for handling hot corrosives are described in Bulletins CE-51/52 and 96 which are available on request.
191e *American Hard Rubber Co.

Piping & Tracing.....A bulletin describing Unitrace which combines piping and tracing in one unit is offered and may be had upon request.
261b *Aluminum Co. of America

Plastic Pipe.....for excellent resistance to over 300 chemicals. To help you make major pipe savings, the new Plastic Pipe Fact-pak is available on request.
269 *Carlson Products Corp.

Plug Valves.....are non-lubricated & non-sticking. Hamer plug valves give maximum service with minimum maintenance. New and complete Hamer valve Catalog 60 is offered.
264 *Well Equipment Mfg. Corp.

Steel Pipe.....Rubber-lined steel pipe combines strength of steel with chemical resistance of Ace Hard Rubber. Bulletin CE 51/52 is available.
191c *American Hard Rubber Co.

Steel Valves.....Hancock steel valves provide the dependable protection demanded for every process application. Further information in Catalog 200A.
42-43 *Manning, Maxwell & Moore

Swivel Joints.....US type are designed exclusively for the chemical industry. Can be welded into the line and can be repaired on location with simple tools. Catalog.
97 *Continental-Emsco Company

Tubes.....Condenser and heat exchanger tubes are available in over 50 metals and alloys along with Duplex tubes in various materials. Further information is offered.
241 *Bridgeport Brass Co.

Tubing, Welded Steel.....Prevent corrosion when the pressure's on with welded stainless steel tubing. Available in Schedules 40S, 10S & 5S. Booklet 8591.
56 *Welded Steel Tube Institute

Valves.....for the control of hot, cold, erosive, corrosive or viscous fluids. Designed to accept all standard actuators. General Catalog 1500-E is available.
209 *The Annin Company

Valves.....New 2 and 3-way valves are readily adaptable to your requirements. This valve design lends itself to a variety of special-purpose applications.
6 *Chandler Evans Corp.

Valves....."See-Through" safety relief and check valves seal gases and liquids. Detailed information is contained in Bulletin RV-1 and Bulletin CV-100.
1275 *Chem Flow Corp.

Valves.....Sleeve valves offer a larger sealing area, better adjustment, no pocket to collect liquids & solids. Further information in Bulletin V/14.
199 *The Duriron Co., Inc.

*From advertisement, this issue

SERIES 300 PROPORTIONING PUMPS



ADJUSTABLE IN OPERATION FROM ZERO TO FULL CAPACITY

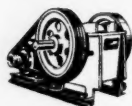
The unique control mechanism on American's new 300 Series Pumps provides full range adjustment while the pump is operating. Capacities range from 1 to 812 gallons per hour on the simplex series and from 2 to 1624 gallons on the duplex series. Maximum working pressure is 10,000 PSI. For maximum versatility and absolute minimum maintenance the Series 300 also incorporates these quality American design features:

- Interchangeable liquid ends.
- New cam adjustment mechanism controls pump plunger stroke from any point from zero to maximum output.
- Compact housing — all moving parts enclosed.
- E-Z Clean Cartridge Valves for simple maintenance.
- Plunger (diameters from 1/4" to 2 3/4") serviceable without disturbing the adjustment mechanism.

For use in high-corrosion environments, new Series 300 American Pumps are available with plungers and liquid end made in either ceramics, chrome plate or stainless steel. Remote or automatic controls are also available. Write American Meter Company for full details.

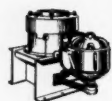
AMERICAN[®]
METER COMPANY
INCORPORATED ESTABLISHED 1936
pump division
13500 PHILMONT AVE. PHILADELPHIA 16, PA.

Laboratory Crushers and Pulverizers



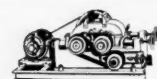
**4"x 6" Massco
Laboratory Jaw
Crusher**

Welded steel frame; manganese steel jaw and cheek plates; bronze bushed bearings; smooth jaws give better product and easier cleaning. Adjust for plate wear and product size by convenient hand wheel adjustment.



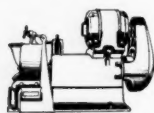
**6" and 10" Massco
Gy-Roll Reduction
Crusher**

Reduces 1/2" feed to as fine as 10 mesh in single pass. High capacity, low power consumption.



**Laboratory
Crushing Rolls**

Sizes (Diameter x width): 10" x 6" and 12" x 8". Adjustable roll space setting up to 3/4". V-belt drive. Heavy, cast frame absorbs vibration, results in long life.



**Massco-McCool
Pulverizers**

Disc type grinder with a planetary movement. No gears. Will grind 1/4" to 150 mesh in one pass.



**Marcy Pulp
Density Scale**

Gives direct reading of weight; specific gravity of liquids, pulps, and dry solids; percent solids in pulp. Very accurate. Easy to clean.

MINE AND SMELTER SUPPLY CO.



**3800 RACE STREET
DENVER, COLORADO**

**OFFICES AND
AGENTS IN
PRINCIPAL CITIES**

LITERATURE . . .

Valves. . . . Feature a deep stuffing box for an extra amount of special packing. Valve bodies are designed with full flow areas for maximum flow conditions.

115 *Wm. Powell Company

Valves. . . . feature longer life-six, eight, even ten times ordinary types. Sealant system replaces the seat from the outside. Information in Bulletin V-618.

151 *Rockwell Mfg. Co.

Valves, Fittings, Unions. . . . Stainless and alloy steel materials are shown in their application to specific types of piping products in the 432 page Catalog F-10.

166 *Henry Vogt Machine Co.

Process Equipment

Air Classifier. . . . Combined with a grinding mill, this system is an integrated grinding, classifying and product conveying system. Bulletin AH-467-11 available.

246 *Hardinge Co., Inc.

Centrifugals. . . . Batch-Master centrifugals combine rapid bottom unloading with inherent stability of patented Center-Slung suspension. Illustrated bulletin.

255 *American Machine & Metals, Inc.

Dissolvers. . . . For use with any product requiring mixing, dissolving, dispersing, emulsifying or deagglomerating. Further details are available on request.

143 *Morehouse-Cowles, Inc.

Dryer. . . . Rotary Steam Tube Dryers engineered to dry 264,000 lbs. per day, are described in Catalog A. Also covers pressing, drying and cooling problems.

BL287 *Davenport Machine & Fdry. Co.

Dryer. . . . Lectrodryers dry air to a very low dewpoint to keep operations on the straight & narrow path. Case history sheets and other drying help are offered.

276 *Pittsburgh Lectrodryer Div.

Dust Recovery Equipment. . . . Cyclones, scrubbers and filter for almost every dust control application. They are efficient, economical. Bulletin A-9159.

260 *The Ducon Company

Filter. . . . EimcoBelt continuous belt filters successfully handle slurries that have always been considered impossible for vacuum filtration. Bulletin FE-2053 is offered.

Cover *Eimco Corp.

Filter. . . . New horizontal tray filter offers a variety of features. Size, depth & number of trays depend on nature & amount of material to be processed. Bul. 152.

234 *T. Shriver & Company, Inc.

Filter Press. . . . can be used for a multitude of applications—go from one chamber to full capacity. The Sperry Catalog is available for information.

145 *D. R. Sperry & Co.

Filters. . . . Details on how custom engineered Niagara Filters can help with your processing problems is contained in Bulletin NC-457 which is now available.

254 *American Machine & Metals, Inc.

* From advertisement, this issue



THERMOCOUPLE ASSEMBLIES

More than 100 complete T/C assemblies available in a range wide enough to cover most applications in any industry, under any environmental conditions. Included are straight, angle, high-speed, high-temperature and spring-loaded assemblies. They are among many thousands of accessories—all available from a single dependable source—to help your instruments perform at their best.

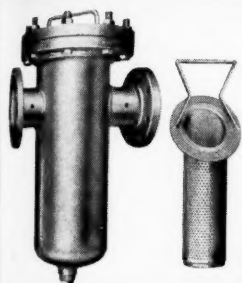
Get details from your Honeywell field engineer, or write today for Catalog G100-1.

MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa. In Canada, Honeywell Controls, Ltd., Toronto 17, Ontario.

Honeywell

First in Control
SINCE 1885

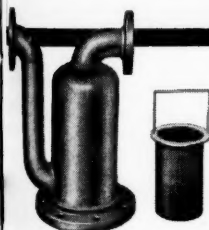
individualized TO YOUR NEEDS MULTI-METAL TRAP STRAINERS



Stainless steel resin trap strainer for demineralized water at 180 psi in nuclear power station.



Basket-within-basket strainer, with quick opening cover for water-soluble adhesives.



Strainer with special shell for PVC resin in solvent, for max. operating pressure of 250 psi.

These and many other strainers and filter-strainer units are the result of Multi-Metal's ability to test, design, engineer and produce practical units that solve particular problems of strainer installation, operation, cleaning and maintenance. Bulletin 601 tells how. Get a copy.



**MULTI-METAL
WIRE CLOTH CO., INC.**

1353 GARRISON AVENUE, NEW YORK 59, N. Y.

LITERATURE . . .

Filters...... Duo double duty fluid filter is sealed at each end to eliminate trespassing. In bronze, steel, 316 stainless steel & aluminum. Full data is offered.

TL303 *Ronningen-Petter Co.

Flakers......for rapid & continuous conversion of molten products to solid flakes. Fully enclosed or open types may be used to produce many products in a flake form.

299 *Goslin-Birmingham Mfg. Co.

Flash Drying Systems......offer flexibility in application. This is a versatile system that can be readily adapted to your particular problem. Catalog #82E.

164a *Combustion Engrg. Inc.

Floats, Stainless Steel......New booklet includes construction data, application information, shape specifications, weight tables, buoyancy formulas, etc.

TR303 *Chicago Float Works

Fluid Bed Systems......A supplementary form or Raymond drying systems for special applications. Information is contained in Bulletin 88E which is available.

164b *Combustion Engrg., Raymond Div.

Hammer Mill......Many exclusive features, unavailable in other equipment, promise ultimate economy. A catalog is available on request for further details.

235 *Williams Patent Crusher

Homogenizers & Mills. Laboratory Homogenizer Bulletin LH-55 is offered along with RE Colloid Mill Bulletin C-57 for complete information on this equipment.

242 *Manton Gaulin Mfg. Co.

Inert Gas Generators......stand up under the toughest conditions, yet produce with complete dependability. Complete information in Bulletin I-10.

193 *The C.M. Kemp Mfg. Co.

Liquids-Solids Separation......Eight types of centrifugals and filters to separate solids from liquids. Research & Development Center for pilot-scale testing.

2 *Bird Machine Company

Micronizers......grind and classify in one operation in a single chamber. Provide fines in range from 1/2 to 44 microns. Eight models available featuring no attrition heat.

R287 *Sturtevant Mill Co.

Mills......Complete information on "Jet-O-Mizer" mills, "Jet-O-Clone" dust collectors and testing and custom grinding services is now available on request.

218 *Fluid Energy Processing & Equip.

Mixer......Nauta Mixer offers new three-way action. It features highest mixing accuracy, lowest mixing time, easy addition of liquids, starts under full load, etc. Bulletin.

250 *The J. H. Day Co.

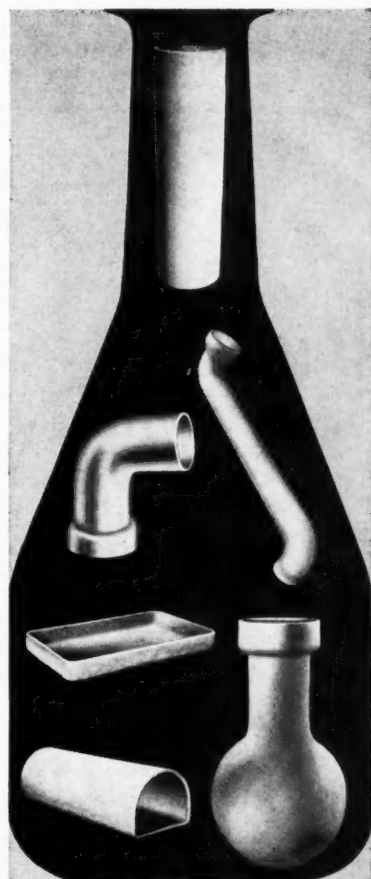
Mixing Equipment......Eureka precision mixing equipment for accuracy, economy and cleanliness in your blending. A catalog is offered giving details.

304 *S. Howes Company, Inc.

Molecu-Dryer......A new type MSX molecudryer has been developed to supply pure, dry air at 100 deg. F. & solve instrument air problems. Full details in Bulletin 1060C.

L288 *C. I. Hayes, Inc.

* From advertisement, this issue



VITREOSIL®

PURE FUSED QUARTZ

FINEST QUALITY IN INDUSTRIAL WARE

- Absolute Chemical Purity
- Extreme Heat Resistance
- Thermal Shock Resistance
- Chemical Inertness
- Outstanding Electrical Properties
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VITREOSIL easily meets critical production requirements . . . replaces more costly materials. Available in many types and sizes. Also fabricated to your special needs. See our ad in *Chemical Engineering*, *Electronic Engineers Master* and *Electronic Designers' Catalogues*.

Write for complete illustrated catalog.

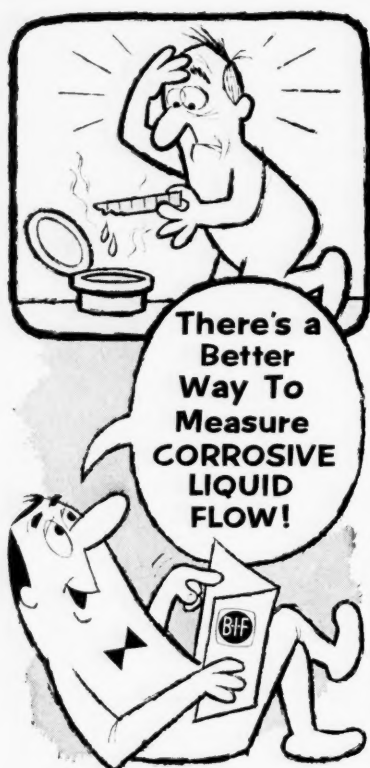


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FUSED QUARTZ CO., INC.**

18-20 Salem St., Dover, N. J.



POSITIVE CONTROL OF MATERIALS FLOW



Problem fluids resisting measurement . . . upsetting your process? Keep them in line with B-I-F's unique plastic insert Dall Flow Tube. Completely corrosion-resistant in construction, this low cost unit meters water, trade wastes, process chemicals, salt water, air and gases with high accuracy and extremely low pressure loss. Insert design permits easy installation within pipeline at any flanged joint . . . no special equipment or supports required.

Free Facts

Beat the corrosive liquid metering problem. Request free Facts today on this low cost, light weight, versatile flow meter!



Industries

A DIVISION OF
THE NEW YORK AIR BRAKE COMPANY

369 HARRIS AVENUE, PROVIDENCE 1, RHODE ISLAND

LITERATURE . . .

Precipitator The SF[®] electric precipitator features simple, rugged construction, uniform gas distribution, fool-proof power supply and minimum maintenance.
148 *Buell Engineering Co.

Pressmaster dewaterers virtually all fluid yielding solids, maintains uniform product, high yields. Further information is available on request.
R275 *Zenith Press Division, E. D. Jones

Pressure Filters Sluice-O-Matic horizontal pressure filters are described in an application report, 100P-12-N-7 which is available on request.
135 *Industrial Filter & Pump Mfg. Co.

Process Equipment Catalog 392 covers research, engineering and service of evaporation, drying, solvent recovery, cooling and other processes.
213 *Blaw-Knox

Process Equipment Catalog shows equipment for homogenizing, heating, cooling, flavorizing, storing, separating, freezing, mixing, packaging and conveying.
165 *Cherry-Burrell Corp

Process Equipment Votator process equipment and systems step up quality and profits. The whole story is contained in Bulletin V250-12J which is available.
117 *Girdler Process Equip. Div.

Process Equipment Air Swept Grinding Systems are available for a wide range of capacities and products. Full details are available on request.
109 *Kennedy Van Saun

Purifiers Hi-Ef purifiers have patented two-stage principle of separation with no moving parts. Special Manual 803 contains data on 13 types of separators.
TR306 *The V. D. Anderson Co.

Refrigerated Filter Refrigifilter is a refrigerated packaged unit consisting of filter, separator, condenser, heat exchanger & automatic trap. Bulletin 902.
220 Hankison Corp.

Sampling Cylinders A seamless, one-piece cylinder for maximum safety. Available at pressures to 1800 psi with higher pressures on special order. Info.
105e *Hoke, Inc.

Thickeners Cyclone thickeners add to the effectiveness and capacity of centrifuges when added to your centrifuge installations. Additional information is offered.
272 *Heyl & Patterson, Inc.

Trap Strainers A wide variety of strainers and filter-strainer units to solve particular problems of installation, operation & maintenance, Bul. 601.
L283 *Multi-Metal Wire Cloth Co.

Pumps, Fans & Compressors

Air Compressor features air power, efficiency at all key points, perfect running balance and low, low maintenance. Full details are contained in Bulletin 185.
79 *Clark Bros. Co.



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(I didn't buy a Taylor Comparator the first time.)

I thought comparators were pretty much the same, but, was I wrong! Broke two of those fragile, individual glass standards the first week . . . and things were really fouled up. Got a Taylor Comparator as soon as I could . . . and I'm really sold on Taylor. You can't beat a slide with all the color standards right in it for convenience and easy use.

Taylor Comparators — with guaranteed non-fading color standards in a single slide — let you make fast, easy, accurate tests for pH chlorine, phosphate, silica, nitrate and chromates, etc. . . . right on the spot. You get dependable data to help you control chemical processing, water purification, waste treatment.



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Taylor Midget Iron Tester, Taylor Water Analyzer for colorimetric water analysis.

ALL TAYLOR COMPARATORS HAVE GUARANTEED NON-FADING COLOR STANDARDS

SEE YOUR DEALER for Taylor Sets or immediate replacement of supplies.



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414 STEVENSON LANE • BALTIMORE 4 • MD

*From advertisement, this issue



Replace costly machined or molded parts with formed RULON® Tape.

Leading manufacturers across the country are cutting design costs by stamping or post-forming parts from RULON (filled TFE) tape. With Dixon's RULON Tape in thicknesses

from .004" to .125", you pay only for what you use. You use a minimum of material . . . and reduce costs up to 10 to 1. You take advantage of RULON's plastic memory, too, for tighter fits and better seals. RULON Tape gives your product these performance-improving qualities: (1) low friction, (2) high wear resistance, (3) low deformation under load, (4) wide temp. tolerance

(-400°F to +500°F), (5) chemical inertness, (6) lube-free operation, and (7) zero water absorption.

Whether you need stamped or post-formed parts for pumps, valves, compressors, bearings, meters, or what have you, it pays to rely on (1) Dixon's wide selection of basic shapes (in both RULON and Teflon), (2) Dixon's knowledge of fluoro-carbon reinforcing agents, and (3) Dixon's facilities for fabricating parts to print.

See RULON designers guide book — Bulletin #9572 in Sweet's Product Design File, or send details for recommendations. DIXON CORPORATION, 101 BURN-
SIDE ST., BRISTOL, RHODE ISLAND.

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DIXON

LITERATURE . . .

Blower and Gas Pumps for clean, dry, oil-free air. Information on the complete line of rotary positive blowers and gas pumps in Bulletin AF-258, XA-458 & RA-261.

BL303 *Roots Connersville Blower

Centrifugal Pumps equipped with Remite mechanical seal for leak-proof operation. Immediate delivery on pumps in factory stock. Catalog CSP-360.

53 *Bell & Gossett Company

Centrifugal Pumps fabricated of 18-8 stainless, zirconium, tantalum or monel are available. For further information Catalog 2 is available on request.

TR305 *Instronics Div. of Jani, Inc.

Compressors A wide variety of designs of compressors in sizes up to 5,000 horsepower and for pressures up to 15,000 psig. Motor or steam drive. Information.

34-35 *Chicago Pneumatic Tool Co.

Compressors Two new heavy-duty air compressors with 50 to 240 cfm piston displacement are described in Bulletin LA-1. Feature new water-cooling design.

153 *Gardner-Denver Co.

Compressors Booklet "Compressors for Industry" describes Pennsylvania Compressors from 10 to 350 hp, horizontal, angle, and Oil-free models. Available now.

207 *Pennsylvania Pump & Compressor

Compressors, Oil-Free Heavy-duty construction with particular attention to the non-lubricated cylinder parts results in extremely low maintenance. Bul. 2469-11.

197 *Joy Mfg. Co.

Controlled Volume Pump New Miroyal pumps have a totally enclosed, self-lubricated drive. Details are contained in bulletin 258-1 which is available on request.

4 *Milton Roy Company

Pump Centri-Chem centrifugal pump handles most chemicals including slurries with particle size up to 1/4", as well as troublesome sticky fluids. Literature.

156a *Eco Engineering Co.

Pumps Electri-Cand pumps are built without packing, stuffing box or seals—the unit is completely fluid tight. Safely handles a wide variety of fluids. Details.

131 *Allis-Chalmers

Pumps Acid pumps centrifugal and gear types, protected by Ace Hard Rubber are described in Bulletin CE-55 which is available on request.

191d *American Hard Rubber Co.

Pumps Special abilities to help solving tough application problems. On-job-capability proved in many nuclear applications. Information in Bulletin 1070-2.

98 *Chempump Div., Fostoria Corp.

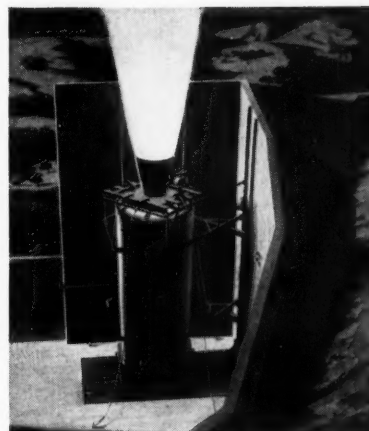
Pumps Karbate frame-mounted Type F pumps have been added to the line of impervious graphite pumps. Details on models and sizes are available on request.

258 *National Carbon Company

Pumps Jet pumps are available in a broad selection of models, standard or special, steam, air or liquid operated in a variety of materials. Information.

224 *Penberthy Mfg. Co.

*From advertisement, this issue



Is there a future for you at UTC?

Would you qualify for participation in advanced propulsion programs—large segmented solid propellant rocket motors, hybrid rocket engines and high energy storable liquid propellant engines? Would you enjoy working directly with recognized professional leaders at UTC's modern research and development complex in the San Francisco Bay Area?

Interviews are now being conducted relative to these positions:

SR. DESIGN ENGINEER—Supervision of a group in design of solid rocket motor components. Requires professional degree and a minimum of 5 years rocket design experience.

ENGINEERING ANALYST—Systems Design. To formulate mathematical models of systems engineering problems and implement solutions by analytical techniques. Requires degree with solid mathematical foundation and 2 years design or systems experience.

PROCESS ENGINEER—For rocket motor processing studies and process methods improvements. Requires chemical engineering degree and direct propellant processing experience.

PROPULSION ENGINEER—For analytical studies of solid and liquid propulsion systems. Requires degree with extensive mathematics, thermodynamics and fluid mechanics background.

All qualified applicants considered without regard to race, creed, color or national origin.

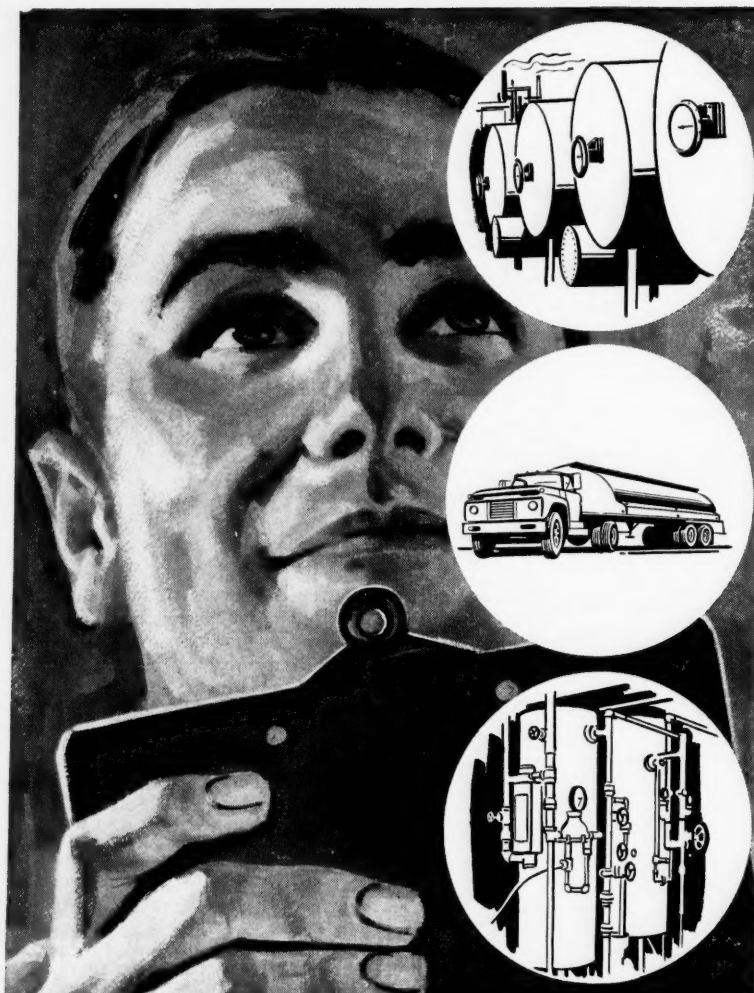


Contact: C. F. Gieseler, Dept. 103

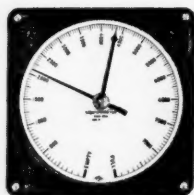
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Capability backed by four decades of propulsion experience



TANK CONTENTS AT-A-GLANCE with Dial-Type Liquidometer Gauges



THE LIQUIDOMETER CORP.

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For added assurance of accurate liquid quantity record keeping, specify easy-to-read Liquidometer gauges. Positive dial-and-pointer type indicators help to prevent erroneous readings . . . speed record keeping by showing tank contents at-a-glance.

Liquidometer gauges are available to measure and indicate virtually any liquid — at the tank site or remotely. Also available: integral or separate liquid level switches for automatic level warning or control. Float, hydrostatic, electric, or electronic operation can be supplied to meet your specific needs.

Let Liquidometer's forty years of experience in liquid level gauging and control work for you. Write for latest literature.

LITERATURE . . .

Pumps. . . . SESC pump line contains more different types of impellers than any other line. Open, closed and semi-open impellers available in five different materials.

116 *Worthington Corp.

Pumps, Mixed Flow. . . . A complete line is available from 6" to 16", for capacities ranging from 500 to 14,000 gpm. Information is contained in Bulletin 211-1.

277 *Lawrence Pumps, Inc.

Pumps, Proportioning. . . . Series 300 proportioning pumps are adjustable in operation from zero to full capacity. Full details are available on request.

281 *American Meter Co.

Rotary pumps. . . . Gearex pumps provide positive displacement, pulseless flow, quiet, vibrationless operation. Horizontal or vertical models. Bul. G-3 is available.

252 *Sier-Bath Gear & Pump Co., Inc.

Solution Metering Pump. . . . with high repeatability, pre-calibrated accuracy and corrosion resistance in four ml/min. ranges. Additional information in Data File 14-38-09.

R279 *Beckman Instruments, Inc.

Services & Miscellaneous

Controlled Slaking. . . . The "art" of controlled slaking of calcium oxide is explained in the paper, "A Study of the Reaction Between Calcium Oxide & Water."

189 *National Gypsum Co.

Fire-Control System. . . . New Primac fire-control system detects fire in milliseconds and offers ultra-high speed protection. Further information is offered.

38-39 *Grinnell Company

Flooring Service. . . . Corrosion-proof Monolithic flooring gives you guaranteed performance. Complete information on this complete flooring service is offered.

237 *The Ceilcote Co., Inc.

Lubrication System. . . . Alemite barrel-to-bearing lubrication is a product and profit boosting production tool. The Alemite catalog is available.

89 *Stewart-Warner Corp.

Lubricator. . . . forces oil of any viscosity against the high steam, gas and air pressure so common in modern compressors, engines & machines. Catalog is offered.

300 *Manzel

Printed Weight Records. . . . New Print-weight "400" prints complete weight records on tickets or sheets, also on strips. Time & data printing available. Bulletin 2017.

280b *Toledo Scale Corp.

Safety Equipment. . . . The new Red Book contains flammables engineering fundamentals and complete line of safety containers and operating equipment.

R278 *The Protectoseal Co.

Waste Treatment. . . . Contoured plastic sheets of Dowpac packing media interlock to form a continuous, lightweight grid for treatment of water-borne wastes. Booklet.

81 *Dow Industrial Service

*From advertisement, this issue



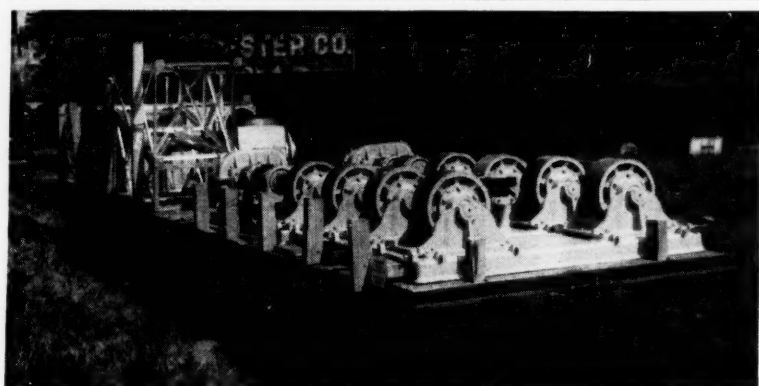
...without help, using a POWER-CURVE Loader

Bag loading costs of eight cents a ton are not uncommon in plants using Power-Curve equipment. One man loads and stacks direct from the packer with no need to lift a single bag. Loads can be palletized or stacked in any pattern, also put into warehouse storage.

There are Power-Curve installations near you. Let us show you how your plant can benefit from a custom engineered Power-Curve loading operation.

Literature and engineering details sent on request.

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"DAVENPORT" Equipment Features

Years of efficient service are designed into DAVENPORT DRYERS & COOLERS—UNDERCARRIAGES and their AUXILIARY PARTS (pictured above) are engineered to do the job, carry the required load, and minimize maintenance cost. Permits simple and quick alignment and adjustment.

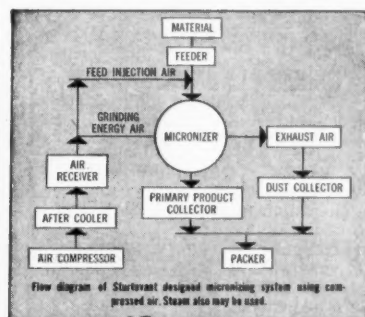
Let our engineers consult with you on your Pressing, Drying and Cooling problems or send for our catalog "A". For quick reference—consult your Chemical Engineering Catalog.

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and Direct Fire
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Water and Air

Need 1/2 to 44 Microns?

**Sturtevant Micronizers*
Make 325 Mesh Obsolete**



One Operation Reduces, Classifies

Sturtevant Micronizers grind and classify in one operation in a single chamber—provide fines in range from 1/2 to 44 microns to meet today's increased product fineness needs. Can handle heat-sensitive materials.

Production Model
(15 in. chamber)

No Attritional Heat

Particles in high speed rotation, propelled by compressed air entering shallow chamber at angles to periphery, grind each other by violent impact. Design gives instant accessibility, easy cleaning. No moving parts.

Classifying is Simultaneous

Centrifugal force keeps oversize material in grinding zone, cyclone action in central section of chamber classifies and collects fines for bagging. Rate of feed and pressure control particle size.

Eight Models Available

Grinding chambers range from 2 in. diameter laboratory size (1/2 to 1 lb. per hr. capacity) to large 36 in. diameter production size (500 to 4000 lbs. per hr. capacity). For full description, request Bulletin No. 091.

Engineered for Special Needs

A 30 in. Sturtevant Micronizer is reducing titanium dioxide to under 1 micron at feed rate of 2250 lbs. per hr. For another firm, a 24 in. model grinds 50% DDT to 3.5 average microns at a solid feed rate of 1200-1400 lbs. per hr. A pharmaceutical house uses an 8 in. model to produce procaine-penicillin fines in the 5 to 20 micron range. Iron oxide pigment is being reduced by a 30 in. Micronizer to 2 to 3 average microns.

Sturtevant will help you plan a Fluid-Jet system for your ultra-fine grinding and classifying requirements. Write today.

Can Test or Contract Micronizing Help You?

Test micronizing of your own material, or production micronizing on contract basis, are part of Sturtevant service. See for yourself the improvement ultra-fine grinding can contribute to your product. Write for full details. STURTEVANT MILL CO., 100 Clayton St., Boston, Mass.



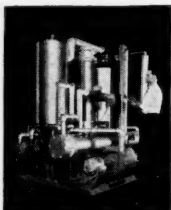
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Division, proves:

NITROGEN GENERATOR PAYS FOR ITSELF IN TWO YEARS!

A RECENT COST COMPARISON prepared for a chemical processing application proves that the savings achieved by generating your own nitrogen instead of buying it can pay for a Hayes Nitro-Gen (TM) generator in two years.



LOOK AT THESE FIG- URES! Let's

assume that your application also calls for 6,000,000 SCF/yr of 99.99% pure nitrogen with a -100°F dew point. Purchased on the most advantageous contract, this volume of tank nitrogen gas would cost you about \$37,000 a year. Produced by a Hayes N2-1000 Nitro-Gen generator with dual stage purification system this same volume of 99.99% pure nitrogen would cost you only \$18,000 a year. This estimate is based on the cost of installed equipment, amortized over 3 years; interest on a 3-year loan; and all costs of materials, utilities, space and labor. The \$19,000 annual savings would return your investment in two years . . . a full year before it is written off. Larger sizes return their investment in only a year.

AFTER THE FIRST THREE YEARS, your annual savings would skyrocket. Your costs of 99.99% pure nitrogen would run as low as 20¢ per MSC for utilities. Moreover, since the Hayes Nitro-Gen generator provides a clean dry system, free from liquids, fumes and corrosion problems, it's one of the most profitable long-term investments you can make.

WANT MORE PROOF? Our Interim Bulletin 5901-N1 spells out the unique principles of the Hayes Dual Stage Purification System . . . also describes the range of sizes and purities available.



Why not write for your copy today? C. I. HAYES, Inc., 843 Wellington Avenue, Cranston, R. I.

C. I. HAYES, INC.

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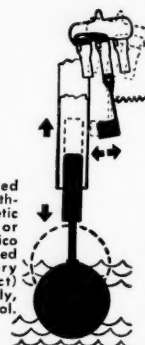


It pays to see Hayes for metallurgical guidance, lab. facilities, furnaces, atmosphere generators, gas and liquid dryers, pHayes-Master (TM) control units.

permanent magnetic force...



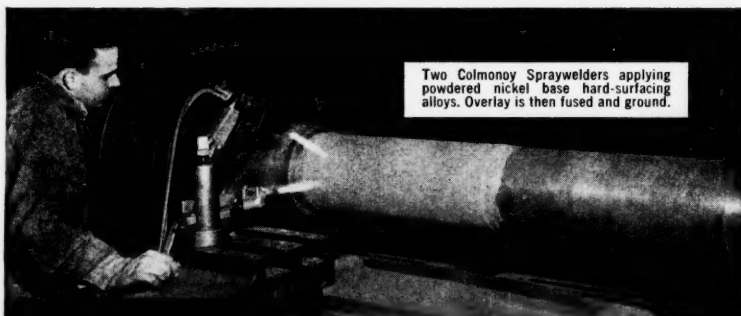
A sleeve, raised and lowered within a nonmagnetic tube, attracts or releases an Alnico magnet attached to the mercury (or dry contact) switch. Basically, this is Magnetrol.



The operating principle behind **MAGNETROL** LIQUID LEVEL CONTROL

Because its operating principle, based on the proper use of a permanent magnet, guarantees a perpetual guardianship over your critical liquid levels, the Magnetrol liquid level control unobtrusively takes the most important place in any system or process where it is necessary to keep a liquid at a constant level. Principle and action are so simple that failure is virtually impossible. Magnetrol is versatile, too—will handle almost ANY liquid, at ANY temperature, at ANY pressure, with the same precision and dependability. No mechanical or electrical linkages to stick, bind, ride out of line or wear out. Available for controlling level changes from $\frac{1}{8}$ " to 150 ft. Multi-stage switching when desired. Write to

MAGNETROL, Inc., 5324 BELMONT ROAD, DOWNERS GROVE, ILL.



Two Colmonoy Spraywelders applying powdered nickel base hard-surfacing alloys. Overlay is then fused and ground.

Mixer Stub Shaft Gets Fast Protection

COLMONOY HARD SURFACING STOPS EXCESSIVE CORROSION / ABRASION

Highly corrosive and abrasive slurry in a drug fermenter demanded a wear resistant mixer shaft. The Sprayweld Process was used to overlay the wear area with Colmonoy No. 6 hard-surfacing alloy. This cut the time required from 72 hours (using manual rod welding) to only eight hours. The Colmonoy overlay shaft outlasts 24 unprotected nickel-alloy shafts.

Investigate non-galling, near-frictionless Colmonoy overlays as a means of reducing excessive wear on your process equipment. Ask for the Colmonoy Spraywelder Catalog.



Photo: New England Hard Facing Co.

HARD-SURFACING



& BRAZING ALLOYS

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"By reason of special training, wide experience and tested ability, coupled with professional integrity the consulting engineer brings to his client detached engineering and economic advice that rises above local limitations and encompasses the availability of all modern developments in the fields where he practices as an expert. His services, which do not replace but supplement and broaden those of regularly employed personnel, are justified on the ground that he saves his client more than he costs him."

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Chemonuclear Processing

Principal programs at our new Nuclear Research Center at Tuxedo, New York (40 miles northwest of New York City) involve the use of a 5 megawatt research reactor for the development of special nuclear fuels, optimizing radiation chemistry processes, product decontamination and varied economic evaluations.

Excellent opportunities for BS, MS or PhD personnel, with up to 6 years' experience in chemical development, unit operations or pilot plant work.

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UNION CARBIDE NUCLEAR COMPANY

P.O. Box 324-R, Tuxedo, New York

A Division of Union Carbide Corporation

All qualified candidates will continue to receive consideration for employment, without regard to race, creed, color or national origin.

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Chemical Engineer, MS preferred, with 3-5 years experience, reporting to Manager of Research. To apply chemical engineering principles to the water and waste treatment field. Supervise and evaluate experimental work and prepare feasibility studies. New staff being recruited by nationally-known, progressive company.

Send resume and salary requirements to

P-7399, Chemical Engineering
Class. Adv. Div., P.O. Box 12, N.Y. 36, N.Y.

ENGINEER—RESEARCH

Excellent opportunity for Engineer interested in iron ore beneficiation and pyrometallurgical research fields. Location: Northern Minnesota. Send resume of education and experience.

P-7181, Chemical Engineering
645 N. Michigan Ave., Chicago 11, Ill.

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Immediate opening on Chemical Engineering's editorial staff of 20 engineer-editors for another young engineer to solicit, evaluate, edit or write technical news stories or articles on process and engineering developments and trends in the chemical process industries. Unusual opportunity to broaden industry and professional contacts, education and experience. Requirements: Degree in chemical engineering or closely related field with experience in chemical process work; ability to evaluate chemical process and engineering information; able to write clearly, concisely and accurately; must like and work well with people; initiative and imagination. New York City location with opportunity for some out-of-town travel. Please send complete resume of education, experience, salary requirement and other pertinent information to:

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Senior Process Engineers

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Expansion has created two staff positions with a leading process engineering and design organization.

These openings require a degree in chemical engineering with a minimum of 10 years experience in the inorganic chemical or petrochemical field.

The men selected will have a record of accomplishment. They will be capable of directing their own work as well as providing technical guidance on a variety of problems within their own specialties.

Salary commensurate with background and experience. Resume will be held in strict confidence; so please include all pertinent details.

P-7136, Chemical Engineering
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You are invited to join the technical staff of a large chemical processing company offering employment opportunities in the desert community of Boron, California

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SW 7254

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Purchasing Agent—Growing midwest processing company has opening for neat, bright, energetic, graduate engineer about 30 years old. Must have some processing experience. Purchasing experience desirable but not essential. Send resume of education, experience, and salary history to P-7263, Chemical Engineering.

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Oliver all rubber 3' x 6' Rotary Precast continuous Vacuum Filter complete with variable speed drive. Rocket type agitator and motor. Excellent condition.

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RAYMOND FLASH DRYING SYSTEM

Complete—Unus d
LINK BELT ROTO LOUVRE DRYERS, 6'x24'
316 S/S

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CIRCLE C ON READER SERVICE CARD

LIQUIDATIONS

CLEVELAND, OHIO

1—Raymond #73612 Super High Side 6-Roll Mill, with whizzer, cyclone, piping and motors.

1—Raymond #6669 Super High Side 6-Roll Mill, with whizzer, cyclone, piping and motors.

1—Raymond #5047 High Side 4-Roll Mill, with whizzer, cyclone and piping

1—#1 Raymond Impact Mill, with whizzer, cyclone and piping.

2—Sturtevant 14' dia. Air Separators.

1—Kilby Nickel Single Effect Force Feed Evaporators, 1200 sq. ft.

2—12,000 gal. Nickel Clad Tanks.

2—Oliver 5'3"x4' Nickel Clad Rotary Vacuum Filters.

2—Pfaudler 300 and 200 gal. Glass Lined Jkt. Agt. Reactors.

1—Sperry 30" C.I. Filter Press, 27 chambers.

1—Bufflovak 32"x90" Dble Drum Dryer.

4—Feinc 8'x12' Rotary Vacuum Steel Filters, string discharge.

2—Peabody Gas Scrubbers stainless steel 11,000 CFM and 6,000 CFM at 145°F with fans, motors.

2—6'6" dia. x 60' Rotary Dryers.

1—5 1/2'x4 1/2'x50' Rotary Dryer.

1—5 1/2'x4 1/2'x60' Rotary Dryer.

7—Dorr 80' and 40' thickeners.

3—Vogt 387 sq. ft. Rotary Press. Filters.

2—Chicago Pneumatic 26"x14" Vacuum Pumps with 150 HP motors.

3—Fuller Kinyon Pumps H5 and H6.

1—Link-Belt 24"x90' Belt Conveyor

5—Nickel Centrif. Pumps, 2", 3".

GENEVA, NEW YORK

2—Vulcan 3'x20' 347 S.S. Packed Columns with 240 sq. ft. S.S. Heat Exchanger.

5—S.S. Condensers 70 to 250 sq. ft.

6—Nash H5, L5 Vac. Pumps 20 & 15 HP.

1—Nash L3 Stainless Vacuum Pump.

6—1,200, 1,000 & 400 gal. 347 S.S. tanks

8—25,000 gal. Aluminum Storage Tanks, 1/2" shell.

2—3000 gal. Aluminum Tanks, 7"x11'.

1—Tolhurst 40" Centrifuge 347 S.S. imperforate basket, 15 HP.

1—Swenson Vert. 347 S.S. Single Effect Evap. 300 sq. ft.

2—Banks S.S. cooling coils, each bank having 24—2" tubes 20' long.

BRILL FOR VALUES

CENTRIFUGES

3—Bird 18" x 28", 24" x 38" Solid Bowl Continuous 304 S.S.

1—Bird 40" x 60" Solid Bowl Continuous 316 S.S. UNUSED.

5—Sharples C-20 and C-27 Super-D-Hydrodrator 316 S.S.

3—Sharples PY 14, PN14 Super-D-Canterers 316 S.S.

2—Sharples #16, 304 S.S., 3 HP motor.

1—Tolhurst 40" 347 S.S. imperforate basket 15 HP UNUSED.

TANKS

25—500 to 3500 gal. Vertical 304 S.S. Tanks opened and closed, some agitated.

6—7500, 6000 and 2000 gal. Rubber Lined Tanks.

1—1500 gal. Stainless Pressure Tank, 5' x 10', 90#.

1—2000 gal. Horizontal 304 S.S. Tank 5' x 12'.

1—2500 gal. Vertical 304 S.S. Tank 8' x 7'.

1—10,000 gal. Rubber Lined Tank 10' x 17'6".

1—5500 gal. 316 S.S. Clad Pressure Tank 250 PSI.

1—12,000 gal. Horizontal Steel Pressure Tank 7'6" x 36', 200 PSI.

5—25,000 gal. Aluminum Storage Tanks.

REACTORS—EVAPS—CONDS—COLUMNS

1—Pfaudler 125 gal. 304 S.S. Jacketed Agitated Reactor 150# int., 125# jacket.

3—Pfaudler 200 gal. glass lined jacketed Kettles.

2—Pfaudler 50 gal. glass lined, Jacketed, Agitated Reactors.

1—650 gal. 304 S.S. Reactor with 100 sq. ft. Bayonet Heater.

1—O. G. Kelly 3000 sq. ft. 309 S.S. force feed evaporator UNUSED.

1—550 sq. ft. Bufflovak monel single effect Evaporator.

1—250 sq. ft. Bufflovak 304 S.S. Single Effect Evaporator.

10—Stainless Heat Exchangers; 910, 536, 370, 250, 131, 70 sq. ft.

1—4'6" x 46' 316 S.S. Clad Column, 250 PSI.

6—30" x 19' S.S. Packed Columns.

1—24" x 35' 304 S.S. Bubble Cap Column.

FILTERS

2—Niagara 110 sq. ft. Vert. 316 S.S.

1—Niagara 92 sq. ft. Vert. Jkt. 316 S.S.

2—#10 Sweetland, 27 leaves 4" centers

1—#5 Sweetland 304 S.S., 120 sq. ft.

1—Oliver 6' dia. Horizontal 316 S.S.

1—Oliver 4' dia. Monel Horizontal.

1—U.S. 200 sq. ft. 304 S.S. Auto-Jet.

1—Hercules 400 sq. ft. 304 S.S. Pressure.

3—Oliver Precoat 5' x 6', 5' x 10', 8' x 10'.

1—Oliver 5'3" x 8' Steel Rotary Vac housing.

1—Feinc 3' x 1' 316 S.S. Rotary Vac.

DRYERS

1—Bufflovak Vacuum Shelf, 17—60" x 80" shelves.

2—Bufflovak 42" x 120", atmospheric double drum complete.

1—Bufflovak 32" x 90" Atmos. Twin Drum.

2—Devine 4' x 9' single drum, atmospheric.

1—Bufflovak 3' x 10' Rotary Vacuum.

6—Louisville Rotary Steam Tube 5' x 6', 6' x 30', 6' x 50'.

2—Louisville 8' x 50' Stainless Steel lined Rotary.

3—Rotary Dryers 4' x 40', 6' x 50', 6' x 60', 7' x 80', 8' x 87'.

1—Louisville 4 1/2' x 25' Inconel Rotary.

1—Link Belt 6'4" x 24' Roto Louvre 316 S.S.

2—Atmos. Tray, 16 shelves, 40"x24".

2—10' and 4' dia. 304 S.S. Spray Dryers.

2—Wyssmont, 304 S.S. 6'2" and 9'6" dia.

MIXERS

1—Sturtevant 75 cu. ft. 304 S.S. Rotary Batch Blender 20 HP.

1—Abbe 110 gal. 304 S.S. Jacketed Agitated Vacuum Dispersall Mixer.

2—Day Imperial 150 gal. jkted. double arm.

2—Baker Perkins 150 and 100 gal. jacketed double arm Sigma blades.

1—Baker Perkins 50 gal. jacketed.

5—Day "Cincinnati" double arm, 250 and 100 gal.

2—Steel jacketed Powder Mixers, 225 and 350 cu. ft.

1—1500# Powder Mixer 304 S.S.

1—3' dia. Simpson Intensive Mixer.

1—45" dia. Lancaster Mixer 7 1/2 HP motor.

MISCELLANEOUS

3—Kinney Vacuum Pumps, 1000 cfm, 10 microns, 15 HP.

2—Hardinge 5' x 22" steel lined conical Ball Mills.

3—Mikro Pulverizers, 1SH, 1SI and Bantam.

3—Abbe 2 1/2" x 3' porcelain lined Pebble Mill XP motor.

1—Raymond 10" vert. Mill, 10 HP.

3—Swenson Walker Continuous Crystallizers, 24" x 30' sections.

2—#24 Rotex Sifters 20" x 64", 40" x 56".

5—Day Roball Sifters, 40" x 120", 40" x 84", Double Deck.

6—Nash H6, H5, H3 Vacuum Pumps.

3—Nash H6, 347 S.S. Vacuum Pumps.

2—Stokes Rotary Tablet Machines DD2-DDS2.

Partial List of Values—Send for Complete Circular

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• MODERN EQUIPMENT

• PRICED TO SELL

• STAINLESS COLUMNS •

78"x18"x1/4" Vulcan 318 SS Bubblecap, 14 trays, 180 caps/tray, 50 PSI.
72"x30"x1/8" Budd 347 SS Bubblecap, 21 trays, 38 caps/tray.
48"x41"x5/16" Vulcan 316SS Bubblecap, 40 trays 70 caps/tray 100 PSI.
36"x21"x1/4" 316 ELC SS Packed, 15 PSI.
36"x20"x3/16" Vulcan 316 SS Packed 100 PSI.
30"x30"x1/4" 316 SS Packed 75 PSI.
14"x17"x1/8" 316 SS Packed.
12"x18"x3/16" 347 SS Packed 100 PSI.
18"x66"-7' cone bottom, 1/4" 316 SS Packed Absorber Column Stainless Packing

• COLUMNS •

20"x27" GLASS LINED 50 PSI full vacuum
16"x21" GLASS LINED Scrubber
16"x10" GLASS LINED 25 PSI full vacuum

• REACTORS •

Pfaudler 500 gal ELL Gl. Lined Jkt. Agit.
Pfaudler 300 gal. EL Gl. Lined Jkt. Agit.
Dopp 1700 gal Ni-Resist Jkt. Agit.
Dopp 1000 gal Ni-Resist Jkt. Agit.
Vulcan 1000 gal Everdur Coiled, Agit.
Patterson 1000 gal Steel Jacketed
Patterson 500 gal Steel Jkt. Agit. 2HP XP
Alloy Tank 750 gal Stainless Pressure Still
Alloy Tank 300 gal Stainless Pressure Still
30 gal. Agit. S.S. 316; 1,000 PSI INT. 319 PSI JKT.

• CENTRIFUGES—FILTERS •

Sharples C-27 Super-D Hydrator Stainless
Sharples C-20 Super-D Hydrator Stainless
40" Fletcher Susp Centrifuge Perf. 15/7 1/2 HP
30" Susp Centrifuge—Imperforate Stainless
Sharples #6 Super Centrifuge Stainless Bowl
5'3"x3' Oliver Precast Rot Vac Filter SS
4'x1' Bird Young Rot. Vac Filter Stainless
36"x24" Goslin Rot. Vac Filter Stainless
48"x36" Stainless Nutsche Filter
#11 Sweetland 640 Sq. ft. 48 Stainless leaves
18"x28" Bird Continuous Stainless

• DRYERS—KILNS •

8'x60"x5/8" Al. Chalmers Welded Kiln
7'x120"x9/16" Bethlehem Fdy. Kiln
7'x45"x1/2" Link Belt Welded Kiln
604-24 Roto-Louvre Dryer Stainless Steel
6'x124"x3/4" Vulcan Kiln
502-16 Roto-Louvre Dryer
4'x40"x3/8" Welded Dryer NEW Shell
3'x16" Stainless Rotary Dryer
6'x8" Bullovak Vacuum Double Drum Dryer
6'x5'6" Blawknex Vacuum Single Drum Dryer
F. J. Stokes 38A Steam Heated Tray Dryer

• COMPRESSORS—VACUUM PUMPS •

Clark 9920 CFM 149PSIA Suct 239PSIA Dis
Al. Ch. Centrifugal 7500CFM @ 42.5PSI, 1250HP
Worthington YO 1360 CFM @ 35 PSI; 150 HP
Worthington 1015 CFM @ 35 PSI Steam Driven
Norwalk Hydrogen Compressor 5 CFM 15000PSI
Nash #4 Vacuum Pump 650 CFM @ 15"
Nash TS10 2 stage Vacuum Pumps
Nash L3 Stainless Comp. 127 CFM @ 20 PSI
Stokes 612F 500 CFM @ 1mm Vacuum Pump
Worth. 600 CFM @ 50 PSI Comp. 75HP XP
Ing. Rand 450 CFM @ 100 PSI Comp. 75 HP
Nash CD 663 Stainless Comp. 50 CFM @ 75 PSI

• STAINLESS STEEL TANKS •

108,000 gal. 18"x61"x1/4" flat/cone
17,500 gal. 15"x16"x3/16" flat/cone
11,500 gal. 12"x15"x3/16" flat/cone, agit.
10,500 gal. 10"x23"x3/16" dish/cone.
4500 gal 6'x25"x1/4" dish/cone 25 PSI Coiled
4000 gal 8'x12"x3/16" dish Coiled
3500 gal 8'x9"x5/16" dish heads
1500 gal 6'x6"x9"x1/4" dish heads
1200 gal 5'x8"x1/4" Agitated 42 PSI
750 gal 4'x6"x6"x1/4" dish 42 PSI
500 gal 4'x5"x5/16" dish heads
500 gal 4'x5'6"x1/4" flat Agitated
(20) Tanks 50 to 400 gal some agitated

• TANKS •

12000 gal Aluminum 10'x23'3" dish heads
10000 gal Aluminum 9'x23'3" dish heads
7000 gal Aluminum 10'x14" dish heads
3500 gal Copper 8'x9"x1/2" dish Coiled
2000 gal Copper 7'x7"x1/2" dish Agit Coil
500 gal Copper 4'x5'x5/16" dish Coiled
20000 gal Steel 12'x24'4"x7/8" dish 100 PSI
10000 gal Steel 8'x30'x3/8" dish 60 PSI
6500 gal Steel 7'6"x20'x1/4" dish
2500 gal Heresite lined 5'x15'6" 68 PSI
2250 gal Steel 6'x19'x5/16" dish 114 PSI
1250 gal Steel 5'x8" dish Agit. Coil

96,000 Bbl. Storage Tanks 120'x48' (8)

• HAMMERMILLS—CRUSHERS •

Penna SX13 150TPH, 400HP Synchronous Drive
Dixie Mogul #5060 Manganese Lined
Raymond #50 Imp Mill Model C2-855
Bacon Hevi-Duty Style B 20"x6" Jaw Crushers
Universal 5'x6" Jaw Crusher Manganese Jaws
Sturtevant 8'x5" Double Roll Crusher
Raymond #51 Imp Mill

• SPECIAL ITEMS •

MIXER 300 gal. B.P. STAINLESS Sigma 18DIM
B'ENDER Conical 6' Paterson 69CF 10 HP
ENTRAINMENT SEPARATOR—Monel 36"x8'
CALENDER—12' 3 Roll Perkins
GRANULATOR—Stokes Oscillating #243E 5 HP
TABLET PRESS—Stokes Rotary RDS3-DDS2
FORK LIFT TRUCK—1 & 3 Ton Gas Engine, Solid Tire
TRIPLEX PUMP—2 1/4"x4 Stainless 2000PSI
BLOWER 2500 CFM 10 PSI Read Standardair
GAS PUMP 20"x20" Roots Connorsville "RS"
GAS METER 8"x24" Roots 60000CFH
CRYSTALLIZER Squire 40"x30" Agit. Jkt.
CRYSTALLIZER Bullovak 6' Vacuum Jkt. Agit
CRYSTALLIZER Swenson 24"x20" Jkt. SS304
AIR DEHYDRATOR—Anders 8FA Automatic
ABSORPTIVE DRYER—Kemp FE02 S Dual Tower
SIFTER 30"x96" Roball STAINLESS Screen
SIFTER 40"x84" Roball Single Deck
SIFTER 60"x84" Rotex STAINLESS 1 Deck
SIFTER 48" Sweco-Triple Deck Model A9062
CONVERTER—St. Wells 10"x29' 10000 sq. ft.
HEATER 150KW Hot Oil Hynes Elec. Co.
BRIQUETTE PRESS Komarek Greaves 27"x24"
EVAPORATOR—435 Sq. ft. Single Effect
BALL MILL Traylor 8'x11' Steel Lined 300 HP
CENTRIFUGAL PUMPS—STAINLESS—1" to 3"
10 to 750GPM 35 to 100' Head
LARGE QUANTITY STAINLESS STEEL PIPE & VALVES

• CONDENSERS—HEAT EXCHANGERS •

Pfaudler 2", 3" & 4" Double Pipe Coolers, Gl. Lined
6931 Sq.ft. Steel 2"x11ga.x12' Tubes
1056 Sq.ft. Steel 3/4"x16ga.x10' Tubes
141 Sq.ft. Steel 3/4"x14ga.x8' Tubes

• STAINLESS HEAT EXCHANGERS •

2320 Sq.ft. 33"x21"—1"x16ga.x16' Tubes
1000 Sq.ft. 27"x168"—3/4"x16ga.x14' Tubes
890 Sq.ft. 22"x20'8"—5/8"x16ga.x14' Tubes
800 Sq.ft. 23"x17'10"—3/4"x16ga.x16' Tubes
615 Sq.ft. 22"x15'9"—5/8"x16ga.x10' Tubes
420 Sq.ft. 18"x9'6"—3/4"x18ga.x8' Tubes
300 Sq.ft. 14"x19'6"—3/4"x18ga.x12' Tubes
235 Sq.ft. 16"x8'3"—5/8"x16ga.x7' Tubes
188 Sq.ft. 11"x16'8"—5/8"x14ga.x12' Tubes
146 Sq.ft. 11"x13'10"—5/8"x16ga.x9'6" Tubes
68 Sq.ft. 8"x17'3"—3/4"x16ga.x16' Tubes
1860 Sq.ft. REBOILER 54"x23', 1"x12' Tubes

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COMPLETE CHEMICAL PLANT

Formerly Owned By The TOMS-RIVER CINCINNATI CHEMICAL COMPANY



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FOR SALE
or LEASE in
Its Entirety
or
Separately

EQUIPMENT
MODERN
BUILDINGS
REAL ESTATE

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the Premises

REACTORS and PRESSURE VESSELS

- 9—Pfaudler and Glasscote 500 gal. Jacketed and Agitated Reactors.
- 5—Steel Jacketed and Agitated 500 gal. Reactors.
- 10—Lead Lined Sulphonators in various sizes from 500 gal. up.
- 1—6500 gal. Welded Steel ASME Brick and Lead Lined Pressure Vessel with Agitator.
- 1—Lead and Brick Lined 1000 gal.
- 2—Lead Lined Jacketed Hi Internal Pressure, Agitated Reaction Kettle.
- 1—1200 gal Rubber Lined with HAVEG Gate Type Agitator.
- Cast Steel and Welded Steel Jacketed and Agitated NITRATORS, Autoclaves, Stills and Blow Cases.

ROD MILLS

- (4) 6'4" x 6'4"
- (2) 5' x 4'6"

FILTER PRESSES

SHRIVER Plate and Frame Presses in Cast Iron, Wood, Ni-Resist, etc. Many with HYDRAULIC Closing Devices.

- (4) 24" x 24"
- (34) 36" x 36"
- (50) 30" x 30"
- Dozens of Skeletons . . . All Sizes, Types.
- 69—J. H. Day Round Recessed Plate Open Delivery Presses, 18" and 24".

MILLS

Unlined Steel Ball Mills:

- (2) 3' x 5'
- (14) 5' x 7'
- (1) 4' x 6'
- (5) 5'3" x 7'3"
- (1) 4'6" x 5'6"
- (1) 6' x 8'

ROTARY BLENDERS

- (2) 6' x 7'6"

DRYERS

- 19—Buffalo Model J Vacuum Chamber Dryers, 60" x 80" with 20 shelves.

- 8—Atmospheric Truck Dryers with Multi Compartments & Accessories.

CONDENSERS - RECEIVERS

- 28—Vertical Condensers and Receivers manifolded together.
- 4—Horizontal Condensers-Receivers.

REFRIGERATION EQUIPMENT

- 2—YORK Cubice Machines with Accessories.
- 1—VOGT Tube Ice Machine & Accessories.
- 1—Large Steel Hopper with Agitator 22' x 29' for receiving ice cubes.

PULVERIZERS

- 5—MIKRO Pulverizers Model #2 S 1.
- 2—Klus Fine Grind Pulverizers.
- 5—Raymond Model "00" Screen Mills.
- 1—Raymond Whizzer Classifier.

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STerling 8-4672

CIRCLE F ON READER SERVICE CARD

THE BIG LIQUIDATION

LITTLE ROCK, ARKANSAS

STAINLESS STEEL TANKS

13,300 gal., 11'10"x15'7", cone top.
12,000 gal., 11'6"x15'6", cone top.
11,500 gal. Pfaudler horiz. blue glass-lined, 8' x 30', dished, coils.
3650 gal., 10' x 7', open top.
3000 gal., 5' x 19', T347SS, ASME 60 psi, dished heads.
1350 gal., 4'x14', T347SS, ASME 60 psi, dished heads, int. coils.
1300 gal., 7' x 4'6", T321SS, closed
1100 gal., 4' x 11', T347SS, ASME 60 psi, 3/16" shell, 1/4" heads.
476 gal., 4'6" x 4', open top.
475 gal., 5'6"x2'6", open top.
445 gal., 6'x2', open top.
300 gal., 4'x3', T347SS, ASME 60 psi, dished heads.
285 gal., 41"x49", open top.
260 gal., 40"x48", closed top.

**SEND FOR
DETAILED CIRCULAR**

STEEL PRESSURE TANKS

28,000 gal. 11' x 38', dished, ASME 75 psi.
28,000 gal. 11' x 38', lead-lined.
14,000 gal., 8' x 36', dished.
11,000 gal., 8' x 27', dished, ASME 300 psi.
9000 gal., 8' x 23', dished.
5200 gal., 6' x 24', dished, 60 psi.
3300 gal., 6' x 15-6", dished, ASME 125 psi.

BOILERS

3—3000 CFM Edgemoor waste-heat boilers, 250 psi, 535 sq.ft., ASME.
5—435 HP Comb. Eng. water-tube boilers, 300 psi, 4620 sq. ft., 34,500 lb. steam/hr. @ 225% of rating, gas or oil fired.

COMPRESSORS—BLOWERS

Worth 3500 CFM air comp., 24 x 15, #LTC-4, 500 HP gas driven.
Chicago-Pneu. 3026 CFM air comp., size #19-32-30-18 x 24, horiz. steam driven.
Elliott turbo-blowers, 11,620 CFM, type 0, 15.9 psi discharge, 125 HP.
Ing.-Rand 6 x 6 x 5 air comp., V-type, 2 cyl, #67D9, type 30.

KETTLES—REACTORS

1400 gal. Pfaudler blue glass-lined jacketed kettles, 84" dia. x 54" high, open top, Stainless Steel cover, 3 HP Agit., Adj. baffle.

1250 gal. Pfaudler blue glass-lined jkt. reactors (Sulphonators), 72" dia. x 72" high, closed, 3 HP Agit.

600 gal. Pfaudler Stainless Steel ammoniating & crystallizing jkt. kettles, 60" dia. x 46" high, open.

250 gal. Pfaudler blue glass-lined jacketed kettles, 42" dia. x 36" high, open top, Stainless Steel cover.

STAINLESS PUMPS

Worthington Worthing Cent. Pumps; 4" x 3", 3" x 2", 2" x 1 1/2", 1 1/2" x 1", w/motors.

LaBour 2" 316 SS self-priming cent. pumps w/motors.

Aurora 2" SS sump pumps

COLUMNS—HEAT EXCHANGERS

24" dia. x 15' high Duriron packed columns, 1" cast sections.

24" dia. x 33' high Duriron & St. St. packed column.

1450 sq. ft. T347SS gas condensers, 3-pass Vert. units.

1000 sq. ft. Duriron pipe coolers.

564 sq. ft. Stainless Steel burner-Preheaters, gas condensers, 3-pass.

400 sq. ft. Stainless Steel open-pipe coolers, 2" IPS pipe

Amer. spiral heat exchangers T316L S/S: 162, 72 sq. ft.

75 sq. ft. nickel 2" pipe coil

Duriron pipe coolers, 159, 130, 125, 99, 54, 44, 42, 10 sq. ft.

Cottrell lead-lined precipitators

STAINLESS PIPE—VALVES

VAPOR PIPE—6" to 20" dia.

PIPE—Sch. 10 & 40, 1"—6".

VALVES—Gate, globe, etc.

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EQUIPMENT CORP.
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PHILADELPHIA 22, PA.
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CIRCLE G ON READER SERVICE CARD

NEW FILTER, stainless steel NIAGARA 48" dia. w/510 sq. ft.

NEW GRANULATOR #24, Stokes oscillating, S/S, also used 43A, S/S

NEW VOTATOR, S/S, lab. model, 4 speed FURNACE, electric, 5"X12"X30" muffle, 1600°C, Globar, w/50KVA transformer

MIKRO PULVERIZERS, 2 model 2TH w/ 10HP motors & vari-drive feeds

OVEN, Truck/Tray, 650° F. electric, 5'X6'6"X14', self-contained package unit.

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No better values at any price

72 CFM 1500 PSI 6 1/4-3 3/4-13 1/2 x 7 CP
80 CFM 3500 PSI 6 1/2-4-1 7/16 x 18 IR ES3
138 CFM 100 PSI 7 1/2-1 1/2-13 IR-ES3
208 CFM 350 PSI 9-4 x 9 Ing. ES2
258 CFM 500 PSI 9 1/2 x 3 1/4 x 11 Ing. ES2 New
288 CFM 100 PSI 9 x 9 Ing. Worth. CP
311 CFM 1500 PSI 10 1/2 x 7 1/2-3 1/2-13 IR-ES3
465 CFM 100 PSI 12 x 11-IR-ES C.P.T. Worth HB
502 CFM 125 PSI 12 x 13 Worth HB
676 CFM 110 PSI 15-9 1/2 x 12 Ing. XRE
686 CFM 106 PSI 14 x 13 Ing. ES
860 CFM 125 PSI 13-8 1/2 x 7 WNI02
1352 CFM 125 PSI 18 1/2-11 1/2 x 8 Ing. XLE
200 HP S/S 3-60-4160
2200 CFM 100 PSI 26-15 x 28 Ch. Pn. oee 350-HP
3-6-4160-4600 .8 PF
1750 CFM 125 PSI 15 1/2-10 x 10 Ch. Pn. wee 300
HP Syn. 3-60-2300

AMERICAN AIR COMPRESSOR CORP.
Chem. Road, North Berger, N.J. UNION 5-1397

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IT COSTS LESS at M & E

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Pfaudler 10 gal. Glass Lined Kettle
Hersey 5'x26' Rotary S.S. Dryer
Buffalo 32"x90" Double Drum Dryer
Day Hy-R Speed Mill 20 HP XP

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CHOICE ITEMS AT ORANGE, TEXAS

- 3—Worthington 160 ton steam-jet vac. refrig. units.
- 1—1200 gal. horiz. steel reboiler, 5' x 8', dished, 320 sq. ft. coils.
- 2—1800 cu. ft. Read T304 SS weigh hoppers, on scales.
- 4—T316 SS blowers; Buffalo, Amer.
- 1—Sharples #16P super centrif., T304 SS, press-tite.
- 2—Sharples C-20, Super-D-Hydrators, T316 SS, w/timers.
- 2—2600 gal. T316 SS tank, 7' x 8', dished, coils.
- 1—2250 gal. T316 SS tank, 7' x 6'-3", dished, Agit.
- 2—1450 sq. ft. T316 SS Condensers.
- 2—Vulcan 10 plate T316 SS bubble-cap columns or scrubbers: 110", 60" dia.
- 6—685 gal. T316 SS vert. tanks, 3' x 13', coils.
- 15—100 gal. T316 SS separator tanks, 20 PSI WP, dished.
- 3—800 sq. ft. T316 SS condensers.

DRYERS—KILNS

- 2—Buřovak 42" x 120" double drum dryers, ASME 160# WP.
- 1—American 42" x 120" dbl. drum.
- 1—Buřovak 42" x 90" dbl. drum.
- 1—Buřovak 32" x 72" twin drum dryer, chrome plated drums, St. St. trim.
- 2—American 36" x 84" Dbl. Drum.
- 1—Buřovak 32" x 52" Dbl. Drum.
- 1—American 36" x 84" double drum dryer, ASME, VACUUM.
- 1—Buřovak 5' x 12', single drum dryer, Vacuum UNUSED.
- 5—F. J. Stokes #138J-16, 195 sq. ft. vac. shelf dryers.
- 1—Nerco-Niro stainless spray dryer.
- 1—Vulcan 10' x 11' x 175' rotary kiln.
- 2—Davenport 8' x 60' rotary, 7/16" welded burners, fans, etc.
- 1—7'-6" x 62' rotary kiln, 1/2".
- 1—6' x 150' rotary kiln, 3/8" welded, w/burners, etc.
- 2—Louisville 4'-6" x 25' rotary steam-tube dryers, welded.
- 1—Bartlett & Snow 3' x 15' rotary dryer, Everdur metal shell.

PRESSES

- 3—Komarek-Greaves 160,000 psi briquette presses.
- 4—Davenport dewatering presses; #1A, 2A, 3A.
- 1—Stokes #T single-punch tab. pres.
- 1—Stokes #RD-3 rotary tablet press.
- 1—HPM 63 ton steeping press, UNUSED.

PERRY FOR PROCESS EQUIPMENT

EVAP.—STILLS

COLUMNS—CONDENSERS

- 1—630 sq. ft. Struthers-Wells T316 SS Calandria evap.
- 7—4050 sq. ft. calandria type evap., copper tubes, cast iron shell.
- 1—1250 sq. ft. Mojonner triple-effect Stainless Sanitary evaporator.
- 4—Buřovak double-effect stainless evap. vert. long-tube type: 1025, 840, 710, 588 sq. ft.
- 1—250 sq. ft. Buřovak T304 SS, single effect recompression evap.
- 1—118 sq. ft. Stokes T316SS Still.
- 1—Vulcan 110" dia. x 16' high T316SS bubble-cap column, 10 trays.
- 1—Vulcan 60" dia. x 16' high, T316SS bubble-cap column, 10 trays.
- 6—30" x 19' T347 SS packed columns.
- 1—1960 sq. ft. T316SS exchanger remov. bundle, ASME 75# WP.
- 1—1450 sq. ft. T316SS condenser.
- 5—1400 sq. ft. T316 SS gas converters.
- 1—900 sq. ft. T304 SS exchanger.
- 3—800 sq. ft. T316SS condensers.
- 1—730 sq. ft. T316 SS exchanger.
- 1—510 sq. ft. T316SS condenser.
- 30—T316 SS heat exchangers & condensers: 425, 410, 400, 290, 277, 200, 186, 165, 150, 142, 105, 83, 73, 54, 50, 30 sq. ft.

MIXERS—MILLS

- 40—Baker-Perkins #17, 200 gal. sigma-blade, jkt. mixers.
- 1—Baker-Perkins #15, 100 gal. Disp., T347SS 25 HP drive.
- 1—Baker-Perkins #15-UUMM, 100 gal., Disp. blade, ASME jkt., 100 HP, Comp. Cover, motorized tilt.
- 1—J. H. Day #6, 100 gal., St. St. sigma.
- 2—J. H. Day #5, 75 gal., sigma.
- 2—145 cu. ft. ribbon mixers.
- 1—Raymond 50", 5-roller hi-side, mill.
- 1—Raymond 66", 6-roll hi-side mill.
- 13—Abbe 6' x 8' patch pebble mills.
- 2—Hardinge 7' x 36" conical mills.
- 1—Gemco 60 cu. ft. T304SS conical blender.
- 1—Bonnot 5' x 10' ball mill.

STAINLESS STEEL TANKS

(T304 UNLESS NOTED)

- 3—20,000 gal., 14' x 15', T316LC, cone bottom, 3/8".
- 2—13,000 gal., 11'-10" x 15'-7".
- 2—12,000 gal., 11'-16" x 15'-6".
- 5—3650 gal., 10' x 7', vert., open.
- 1—3350 gal., 8'x8'-6", agit., 50 psi.
- 1—3300 gal., 6' x 14'-6", vert.
- 1—3250 gal., 6' x 15', T316.
- 3—3000 gal., 5' x 19', T347, ASME 60 psi.
- 2—2600 gal., 7' x 8', T316, dished, coils.
- 1—2250 gal., 8' x 6', T316.
- 5—2100 gal., 8' x 5'-6", dished.
- 1—2100 gal., 6' x 9', T316, cone.
- 12—1750 gal., hoppers, 4'-5" x 7'-4" x 9'-2".
- 4—1350 gal., 4' x 14', T347, dished, ASME 60 psi coils.
- 5—1350 gal., 7' x 4'-6", T321.
- 1—1300 gal., 6' x 6', 3/8", dished.
- 3—1100 gal., 4' x 11', T347, ASME 60 psi.
- 3—1000 gal., 4'-6" x 8'-6", dished.
- 3—850 gal., 4' x 9', 3/8", dished.
- 1—800 gal., 5'x5'-6", 1/4", dished.
- 3—750 gal., 5' x 5', 3/16", dished.
- 6—685 gal., 3' x 13', T316, coils.
- 1—400 gal., 4' x 4', 3/16", dished.
- 3—300 gal., 4' x 3', T347, ASME 60 psi.

PARTIAL LIST

SEND FOR COMPLETE LIST!

KETTLES—REACTORS

- 1—2000 gal. Glasco blue G/L reactor, ASME 50 psi or vac. int., 90 psi jkt.
- 3—1350 gal. T347SS Kettles, open top.
- 1—1000 gal., T316 SS jacketed reactor, ASME, UNUSED.
- 1—1000 gal. Dopp cast iron Kettle, 125# jacket, 15# int., Agit.
- 1—750 gal. Graver T304SS jkt. fermenter, ASME 30# int., 30# jkt., 10 HP Turbine Agit.
- 2—600 gal. T304SS reactors, Jkt., Agit.
- 2—500 gal. T304SS reactors, jacketed, ASME, Vacuum—Unused.
- 6—465 gal. T304LSS reactors, jacketed, 150# int., 175# jkt.
- 1—300 gal. T304 SS jacketed reactor, Vac. ASME—UNUSED.
- 1—300 gal. Pfaunder blue G/L reactor, Agit., Jkt., ASME.
- 1—200 gal. T304SS jkt. reactor.

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| 1-Bird 18" x 28" Cont. Horiz. Centrifuge. All steel constr | 3-8 x 45' Rotary Flame Dryers. 1/2" shell. Comp w/fans. Cyclones & Duct Work |
| 2-Sweetland #7 Filters. 20 lvs 4" centers. Vert sight glasses | 1-Munson 40 cu ft Rotary Blender. New West 7 1/2 HP Gear Motor. Type 4 |
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| 2-16' Mech Air Separators; 1-Sturtevant & 1-Raymond Dbl Whizz | 1-Buřlovak 42" x 90" Dbl Drum Dryer. 55 trim. Ghd Mtr & dr |

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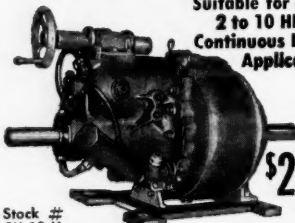
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Variable speed increases production and saves you money! This unit will modernize your machinery . . . with low cost AUTOMATION for HIGH TORQUE applications as: mixers, conveyors; pumps; machine tool drives; lifts and hoists; etc.
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- Dowtherm 225 KW**
Autoclave S.S.—50 gal.—2000 lb. pres.
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Proctor & Schwartz finned drum drier
Centrifuge S.S. 26"—Tolhurst
2 Evaporating Dishes—jacketed S.S. 71" dia.
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CIRCLE P ON READER SERVICE CARD

MODERN REBUILT MACHINERY



Baker Perkins, Day, W & P Heavy Duty Mixers, 5 to 150 gal. caps.

Colton Model 241 Double Rotary—late style Tablet Press

J. H. Day Dry Powder Mixers, 50 to 1000 lbs.

Rotex, Day Sifters, 20 x 48, 40 x 84, 40 x 120.

WRAPPERS: Package Machinery, Hayssen, Hudson Sharp, Battle Creek, Scandia, Wrap-King, all sizes and models.

Pneumatic Scale High Speed Automatic Cartoning Line with Feeder, Bottom Sealer, Top Sealer, Wax Liner, Interconnecting Conveyors.

Stokes & Smith Models G1, G2, HG84, HG87, and HG88 Auger Fillers.

Fletcher 30" Stainless Steel Basket Centrifuge.

Raymond Model "O" Pulverizer.

Mikro 2DH Stainless Steel Pulverizer.

Mikro No. 6 S.S. Atomizer and Bantam, 1SH, 2TH, 3TH, and 4TH Pulverizers.

Green 150 gal. Stainless Steel Double Arm Steam Jacketed Mixing Kettles.

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2 1/2 million dollar plant—operated less than 2 years

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| 2—Swenson S.S. Spray Dryers, 10' dia. | 2—Pangborn Dust Collectors, Type CH-2, 20,000 CFM |
| 12—Downington Pressure Vessels, T 304 S.S., 30" dia. x 7' dp., 200 psi ASME code internal, with coils. | 1—S.S. Tumbler Dryer |
| 2—Goulin High Pressure Pumps, 175 & 300 GPH | 1—Witte S.S. Cooler, 2' x 12' |
| 3—Simpson #21 Rotex Sifters | 4—Lightnin Mixers, 1/2 HP gearhead |
| 10—Jeffrey Feeders | 8—S.S. Tanks & Kettles, 30 to 650 Gal. |
| | Misc. Pumps, S.S. valves, pipe, fittings, controls, etc. |

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9 Gen. Elec. 20, 25, 45, 65, 70, 80, 100 123 Ton
25-Ton Industrial Brownhoist 60' Beam Crane
200—50 Ton Box 300—70 Ton Gondola Cars
300—1 1/2, 5, 20 & 30 yd Dump Cars
- PLANT EQUIPMENT**
2—Wemco 2M-HMS Plants
No. 1 Sturtevant Hammer Bar Mill
No. 2 Robins Vertical Cone Crusher
24" x 24" Jeffrey Single Roll Crusher
No. 1 Sturtevant Rotary Fine Reduction Crusher
F55 Syntron Grizzly Feeder
5' x 6' & 4 1/2' x 9' KVS Air Swept Ball Type Mills
Ball Mills: No. 56, 5' x 5', 6' x 4', & 7' x 22'
Hardinge Mills: 3' x 8', 5' x 22' & 8' x 22'
5' x 22' Hardinge Air Swept Ball Mill complete
New 1951
Rod Mills: 4' x 11', 6' x 12' & 7' x 15'
Jaw Crushers: 8" x 10", 9" x 24", 10" x 30",
12" x 26", 13" x 24", 14" x 28", 18" x 36", 30" x 36", 60" x 84"
Crushers, Fine Reduction: 22", 2', 3', 4', 5 1/2' & 7'
636 & 436 Allis Chalmers Hydrocone Crushers
Crushers Roll: 24" x 14", 30" x 14", 40" x 16"
Rotary Dryers: 5' x 30', 6' x 50', 6' x 70' & 8' x 80'
Rotary Kilns: 6' x 70', 7' x 110' & 9' x 160'
2—43" x 120" Buřlovak Atmos Double Drum Dryer
Roto Louvre #207-10 Type 316 S.S. Link Belt
150—1 1/2, 2 & 4 yd & 30 yd Dump Cars
5 & 10 HP LB Car Pullers
3' x 12' Seco Single Deck Vibrating Screen
16' Gayco Centrifugal Air Separators
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6—30" x 32" Dings Magnetic Head Pulleys
600', 2200', 3068' & 3600-7500' IR. Compressors
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CIRCLE U ON READER SERVICE CARD

BEST VALUES

Vacuum Dryer: Stokes 2' x 6' Rotary, jacketed, st.st. With drive, condenser, receiver.
Evaporator: Buřlovak dbl. eff. st. 608 sq. ft.
Evaporator: Buřlovak dbl. eff. st. 915 sq. ft.
Evaporator: Mojonier dbl. eff. st. 1250 sq. ft.
Dryers: Double Drum, 42 x 90; 32 x 100 Buřlovak.
Dryer: Double Drum, 42 x 120 American.
Heat Exchangers: (2)—1900 sq. ft. admiralty tubes, steel bodies, ASME.
Twin Shell Blender, Patterson-Kelly, 30 cu. ft. S.S. T304, 7 1/2 H.P. drive.
Centrifuges: Tolhurst 40" and 26" Suspended, perl. Centrifuges: Bird continuous, 18 x 28, S.S. T316.
Filter, Rotary Vacuum with pressure housing, Dorr Oliver 53" dia. x 4' face (2).
Tanks: 2300 (2) gal.—1500 gal. vertical St.St.
Tanks: 3000 (2) gal.—1500—900 gal., vertical St.St. for vacuum with coils.
Kettles: (2) 600 gal. agitated st.st.; with 15 P.S.I. steel jacket.

BEST EQUIPMENT COMPANY

1737 W. HOWARD ST. CHICAGO 26, ILL.
AMbassador 2-1452

CIRCLE V ON READER SERVICE CARD

SPECIALS

Kettles: 60 gal. st. steel agit. ASME.
Mill: Day Hispeed Model B 14x30" 3-Roll.
Column: 24" x 22", 316 stain, steel.
Pebble Mills: Abbe #3, #6, and others.
Dryer: American 24x48" dbl. drum.
Dryer: Bowen lab. spray, st. st.
Evaporator: Buřlovak sq. eff. st. 94 sq. ft.
Dryer: Porter 2 x 4' vac. drum, st. st.
Centrifugal: Tolhurst 26" rubber, 2-speed.
Filter: Sweetland #25 st. lined.
Filter: Oliver precoat 12x21" type 316 st. st.
Vacuum Pans: 42" and 72" stain. steel.
Dryer: Proctor & Schwartz 6-tray st. st.
Mixer: Day 150 gal. dbl. arm jkl.

Write us or call Seely 8-1431

Send us a list of your idle machines

LOEB EQUIPMENT SUPPLY CO.
820 W. Superior St., Chicago 22, Ill.

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- 1—Sparkler stainless steel Model 33D7 jacketed filter.
- 1—Dover Type 316 4000 gal. jacketed reactor.
- 1—Alloy Fabricators Type 316 stainless steel 4000 gal. reactor.

AUTOClaves, KETTLES, REACTORS

- 1—Pfaudler Series R 1500 gal. glass lined jacketed reactor, complete with impeller type agitator, baffle and drive.
- 1—Glascote Series HR 1000 gal. glass lined jacketed reactor, complete with impeller type agitator, baffle and drive.
- 1—Pfaudler 750 gal. glass lined jacketed reactor.
- 2—Pfaudler Series EM 300 gal. glass lined jacketed reactors.
- 4—Pfaudler Series P glass lined jacketed reactors, complete with agitators and drives, 5, 20 and 30 gal.
- 1—Glascote 750 gal. glass lined jacketed vacuum receiver.
- 1—2000 gal. stainless steel jacketed reactor.
- 1—Blaw Knox 300 gal. stainless steel vacuum reactor.
- 1—Van Alst 300 gal. stainless steel jacketed kettle.
- 1—125 gal. stainless steel jacketed autoclave with impeller type agitator and drive, 125 psi jacket, 75 psi internal.
- 2—Stainless steel 2000 gal. horizontal storage tanks.
- 6—Blaw Knox stainless steel vacuum receivers, 200 and 100 gal.
- 1—Alloy Fabricators steel jacketed autoclave, 600 gal.
- 1—300 gal. Hastelloy "B" jacketed pressure reactor.
- 2—Theo. Walters Hastelloy "B" 300 gal. jacketed reactors.

CENTRIFUGES

- 4—Sharples Type 316 stainless steel nozzjectors with 40 HP explosion proof motors.
- 1—Bird stainless steel 40" suspended type centrifuge complete with perforate basket, plow and motor.
- 3—Western States Type 316 stainless steel 40" suspended type centrifuges complete with perforate baskets, plows and motors.
- 1—Tolhurst stainless steel 48" Batch-O-Matic centrifuge, NEW.
- 1—Fletcher 48" stainless and underdriven centrifuge, complete.
- 1—AT&M 26" Type 316 stainless steel suspended type centrifuge.
- 5—Tolhurst 40" and 30" rubber covered centrifuges.
- 1—Sharples Type 316 stainless steel Super-D-Canter, PN-14.
- 1—Sharples Type 316 stainless steel centrifuge, Model D-2.
- 1—Sharples Super-D-Hydrator, monel, Model C-27.

DRYERS

- 2—Louisville 8' x 50' stainless steel rotary dryers.
- 1—Bullovak 24" x 36 chrome plated double drum dryer.
- 1—Allis Chalmers stainless steel rotary dryer, 6' x 50'.
- 10—Allis Chalmers rotary dryers, 6' x 50' and 7' x 60'.
- 1—Bullovak stainless steel jacketed rotary vacuum dryer, 5' x 30'.
- 1—Link Belt steel roto louver dryer, Model 207-10.
- 1—Link Belt steel roto louver dryer, Model 502-20.
- 1—American 42" x 120" double drum dryer, ASME, complete.
- 1—Bullovak steel jacketed rotary dryer, 3' x 15'.
- 2—Stainless steel pilot plant spray dryers.

FILTERS

- 2—Oliver stainless steel rotary filters, 3' x 2' and 3' x 4'.
- 12—Sweetland #12 pressure leaf filters with 72 stainless leaves.
- 1—Niagara stainless steel filter, Model 510-28.
- 1—Sperry 36" x 36" heresite covered filter press, 40 chambers.
- 10—Shriver plate and frame filter presses, 12" to 42".



THE GELB GIRL—SEPTEMBER 1961

MIXERS

- 1—Abbe 10 gal. steel double arm sigma blade jacketed mixer.
- 1—J. H. Day 200 gal. stainless steel double arm sigma blade jacketed mixer.
- 3—Sprout Waldron 30 cu. ft. jacketed double ribbon blenders, steel.
- 1—Gemco stainless steel double cone jacketed blender, 69 cu. ft.
- 1—Sturtevant #7 dustite rotary batch blender, NEW.
- 15—Robinson Type 304 stainless steel horiz. blenders, 255 cu. ft.
- 1—Robinson Type 304 stainless steel horiz. blender, 125 cu. ft.
- 1—Baker Perkins 150 gal. dispersion type mixer, complete.
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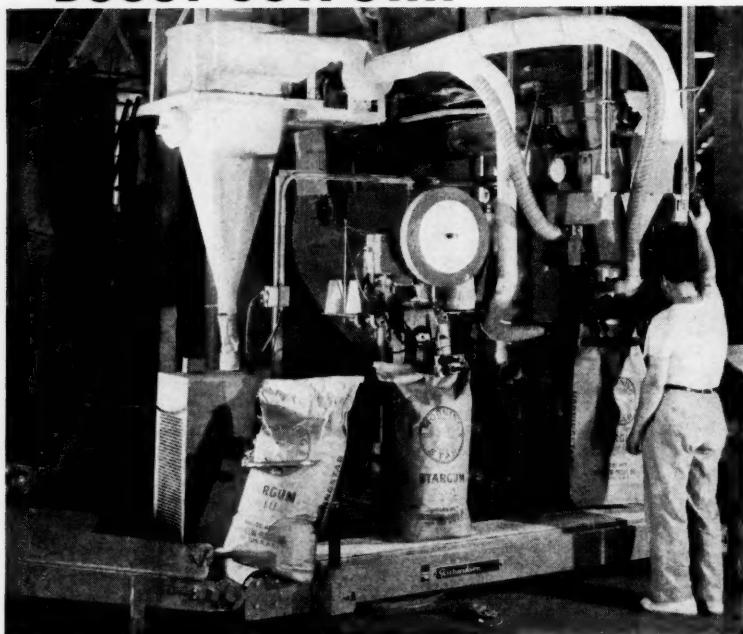
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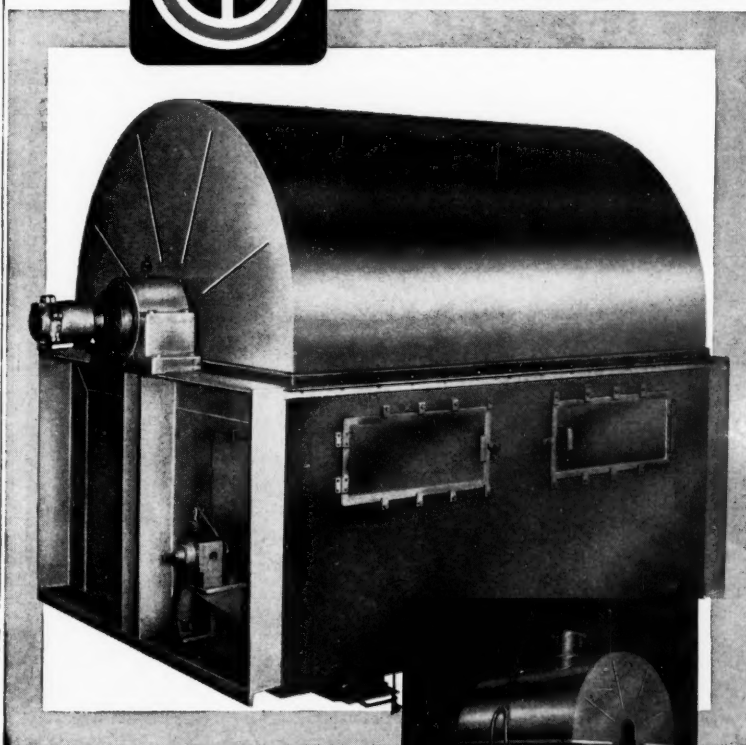
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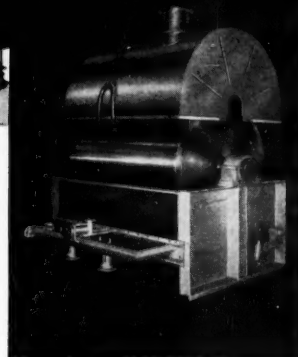
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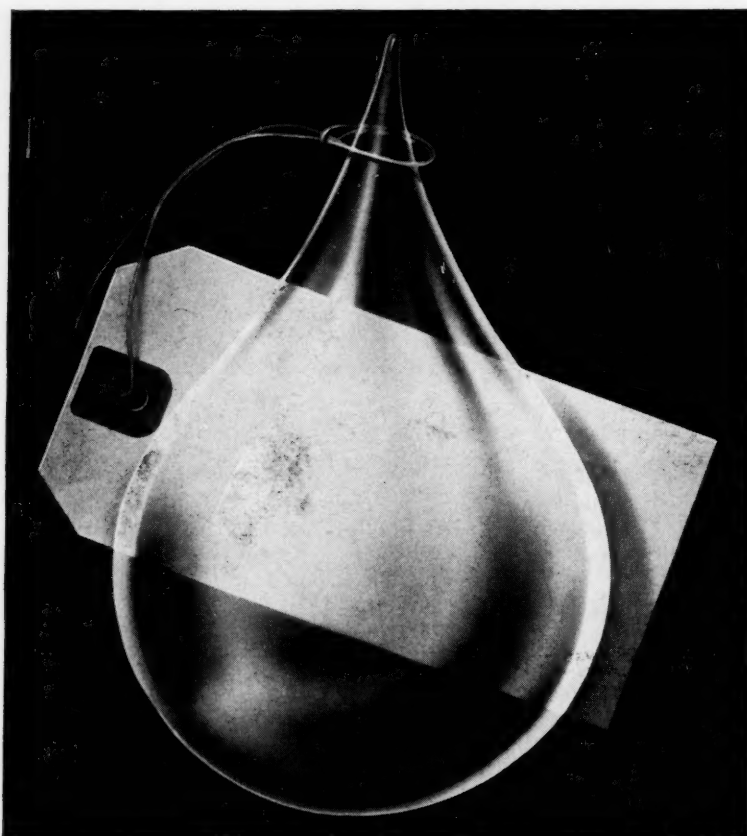
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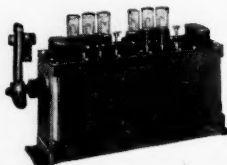
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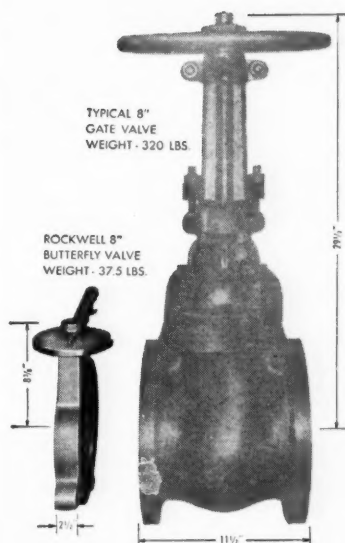
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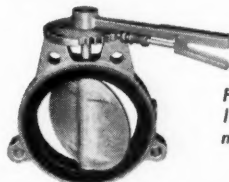
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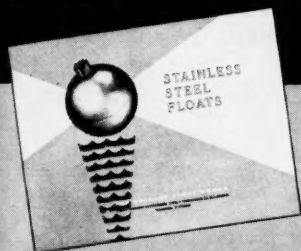
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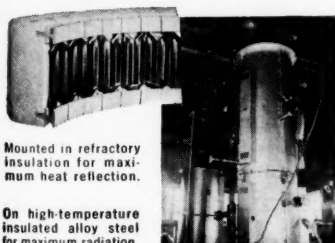
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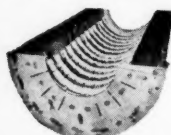


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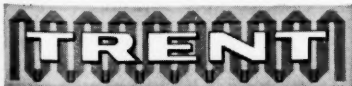
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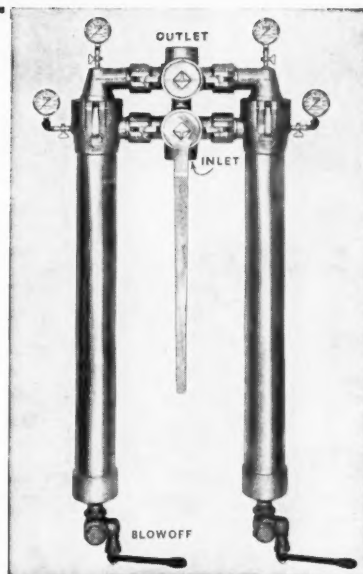
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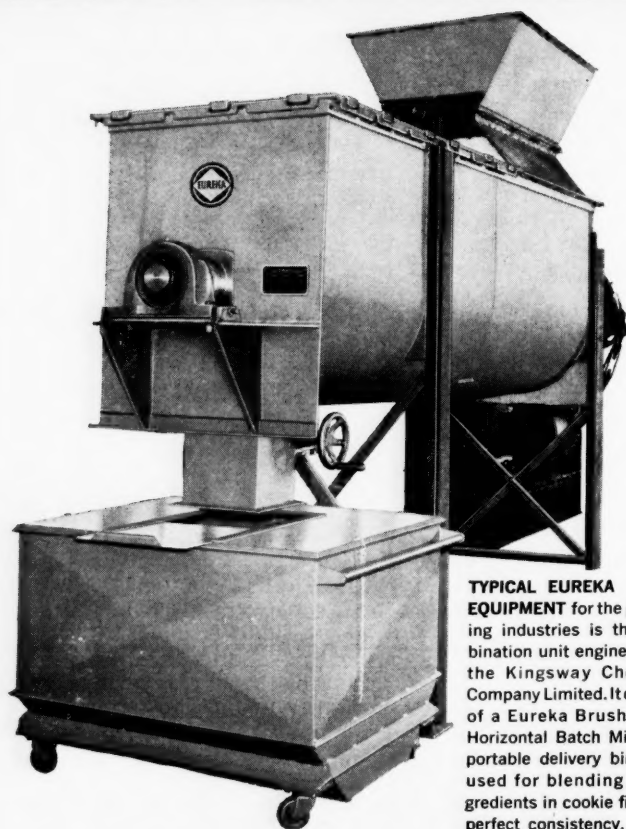
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18-8 Stainless

Zirconium

Tantalum

Titanium

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by

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BREAKTHROUGH

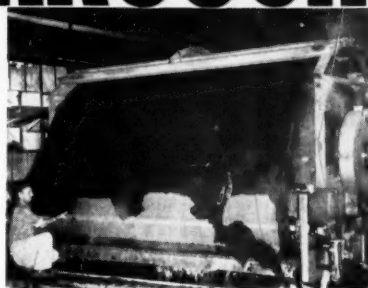
In Cloth Discharge FILTERS

Peterson's new BICRAFT system automatically senses and corrects cloth misalignment without any instrumentation. Its simple "continual correction of error" adds up to reliability in cloth tracking. We call this amazingly simple tracking method:

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hems with cords or springs to wear out.

If you are considering belt type drum filters now or in the future, write us for more information on the BICRAFT system.

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LEVEL INDICATION • DETECTION • CONTROL

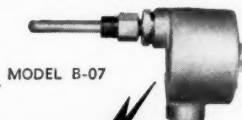
BY RADIATION ...



For positive on-off control and determination of liquid or solid level within a closed vessel or piping using nuclear radiation. Mounted externally. RADIONIC is used NOW for CO₂ fill control, uranium ore hoppers, food container filling, varnish blending, acid slurry refining, asphalt pots, 'green salt' reactors, high energy jet fuels, latex drums, electrical transformer case filling.

Write for Bulletin No. 558

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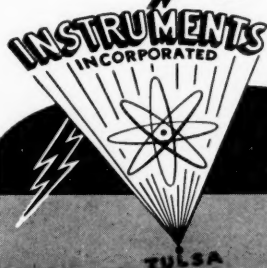


MODEL B-07

A capacitance operated super-sensitive electronic relay. Detects liquid or solid levels, liquid-liquid or foam-liquid interface*. Probe mounted internally. ELECTRO-O-PROBES® are NOW in use for detection of liquors and foam in pulp and paper mills; heavy fluids, acids and fluid interface in chemical plants; alarm for refrigerant control in freezing plants; mixed feeds; water-oil interface; fluids in dairies, breweries, etc.

Write for Bulletin No. B-07

*Model B-07 shown features unitized explosion-proof construction, plug-in components, tank side mounting and is transistorized.



INSTRUMENTS, INC.

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ILLINOIS

ionXchange

A DISCUSSION OF COUNTERFLOW* REGENERATION

**THIS PATENTED METHOD
PROVIDES MORE EFFICIENT
OPERATION OF ION-EX-
CHANGE EQUIPMENT.**

Conventionally, in ion-exchange equipment used for chemical processes, the resin bed is exhausted, or "loaded," by a downward flow of liquid and then regenerated, or "stripped," by a downward flow of acid or alkali.

As a result, the lower part of the resin bed is inadequately regenerated, unless a great excess of regenerant is used. Then, during the service cycle, the impurities thus left near the bottom of the resin bed will be leached off into the product. Or, if the resin is used to pick up valuable materials, an incomplete separation will occur. The logical solution would be *up-flow* regeneration, but normally, due to the low density of ion-exchange resins, the bed would rise or expand and there would be insufficient contact of regenerant. With COUNTERFLOW*, however, Illinois Water Treatment Company has achieved successful *up-flow* regeneration by introducing a "barrier" to prevent bed expansion. For example, one method is to introduce water at the top and regenerant at the bottom, drawing both off just above the resin bed.

Substantial improvements result from COUNTERFLOW*—resin capacity increased as much as 25%, leakage of impurities reduced as much as 75%. Where the resin is used to pick up valuable materials, COUNTERFLOW* "stripping" gives more complete separation without increased dilution.

*COUNTERFLOW is the trademark of Illinois Water Treatment Company equipment utilizing an *up-flow* method of regeneration with a "barrier" to keep the bed from expanding. U.S. Patent No. 2,891,007.

For detailed information, address:

ILLINOIS WATER TREATMENT CO.
840 CEDAR ST., ROCKFORD, ILLINOIS
NEW YORK OFFICE: 141 E. 44th St., New York 17, N.Y.
CANADIAN DIST.: Pumps & Softeners, Ltd., London, Can.

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Hi-eF PURIFIER

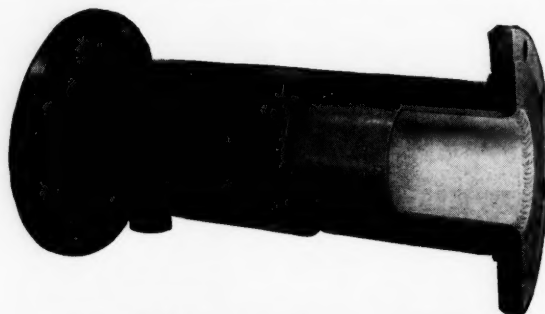
By the Manufacturers of Super Silvertop Steam Traps

THE V. D. ANDERSON COMPANY

Division of International Basic Economy Corporation

1943 West 96th Street

Cleveland 2, Ohio

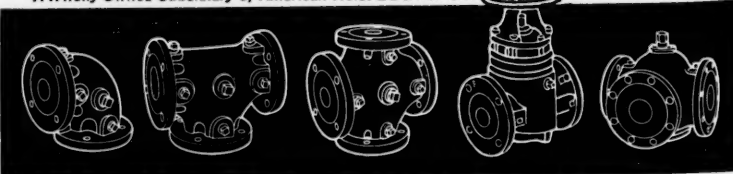


JACKETED PIPE and FITTINGS

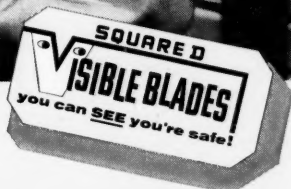
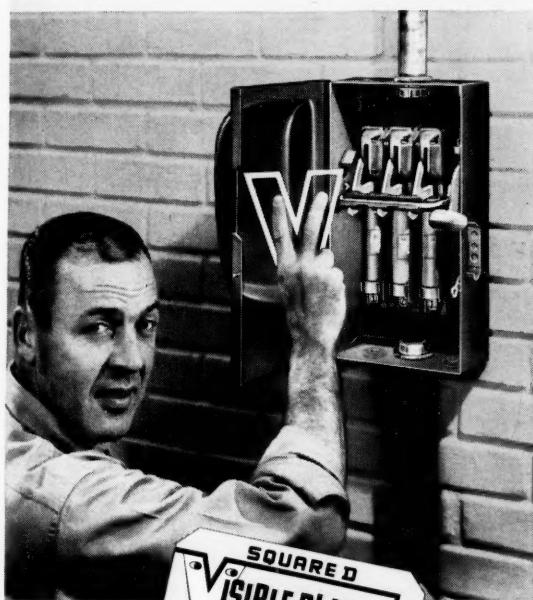
H&B standard jacketed equipment gives complete jacketing of the product line. Special jigs enable H&B to insure uniformity of the jacket area. Fittings and valves are available in cast or welded construction in all alloys including stainless steel. All H&B jacketed equipment is hydrostatically tested to 450 p.s.i. H&B welded steel jacketed fittings are ideally suited for process piping with pressures reaching 300 p.s.i. and temperatures up to 750°F. . . . For more information send for bulletin J-57.

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FOR SAFETY YOU CAN SEE REMEMBER THE "V" FOR VISIBLE BLADES!



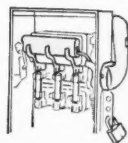
• The men who pull the switches will tell you what can happen when a switch, *believed* to be open — *isn't*. A lot of things can happen—and every one of them is bad. Personnel safety is in jeopardy. Motors can single-phase. Machinery and work can be damaged. Down-time can skyrocket.

Doesn't it make sense to insist on **Visible Blade** construction which gives you a road block against any of those possibilities? Doesn't it make equally good sense to insist on the safety switch which gives you that construction—plus a lot of other performance advantages? Evidently it does, because *Square D switches have never been out of first place in more than 50 years!*

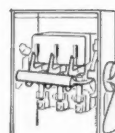
They cost no more... why settle for less?

Square D Company, Mercer Road, Lexington, Kentucky

Extra Safety with Square D's Handle Design



WHEN IT'S
UP
IT'S ON!



WHEN IT'S
DOWN
IT'S OFF!

Handle is integral part of switch, not cover. When door is opened, handle remains attached to switch. Eliminates hazard of false handle indication or defeat of padlock provision. When it's padlocked, it's locked!



SQUARE D COMPANY

wherever electricity is distributed and controlled

FLUIDICS AT WORK



In the foreground is the newest of four Permutit Precipitators at Eastman Kodak's Lake Water Works on Lake Ontario near Rochester, N.Y.

HOW KODAK TURNS 24 MGD OF ITS LAKE WATER REQUIREMENTS INTO PURE WATER FOR CRITICAL USES

■ Row a mile and a half due north from this water plant. Dive 55 feet. You're at the intake end of Eastman Kodak Company's water system.

Travel six miles inland. You're at the Kodak Park Works, where the same water goes into critical manufacture of such quality products as photographic film, paper, and chemicals.

How this raw water, gulped from the lake in such great volume, quickly and economically turns into pure process water is the story behind our picture above.

Heart of the water system: precipitation

Kodak treats this water in three steps: (1) chemicals, (2) precipitation, (3) rapid sand filtration. The heart of the

system is the removal of turbidity and color by precipitation, accomplished with four Permutit Precipitators.

One-hour detention time: savings in space, chemicals

Detention as short as one hour is possible with the Permutit Precipitator — as against two to four hours required in old-method lime treatment and coagulation plants. This higher throughput can save as much as 50% in space to handle a given volume of water.

Savings in chemicals and adsorbents can vary from 10% to 50%. Example: a given amount of coagulant removes

more turbidity, color and algae in the Precipitator, because of the action of the suspended sludge in the mixing zone combined with the upward flow sludge filtration.

20-Page bulletin explains

Like Kodak, you may be faced with a need for big-volume, high-purity water. For full details on the Permutit Precipitator, write for our 20-page Bulletin 2204C. No obligation. Permutit Division, Dept. CE-91, Pfaudler Permutit Inc., 50 W. 44th St., New York 36, N.Y. (In Canada contact the Permutit Company of Canada, Toronto.)



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